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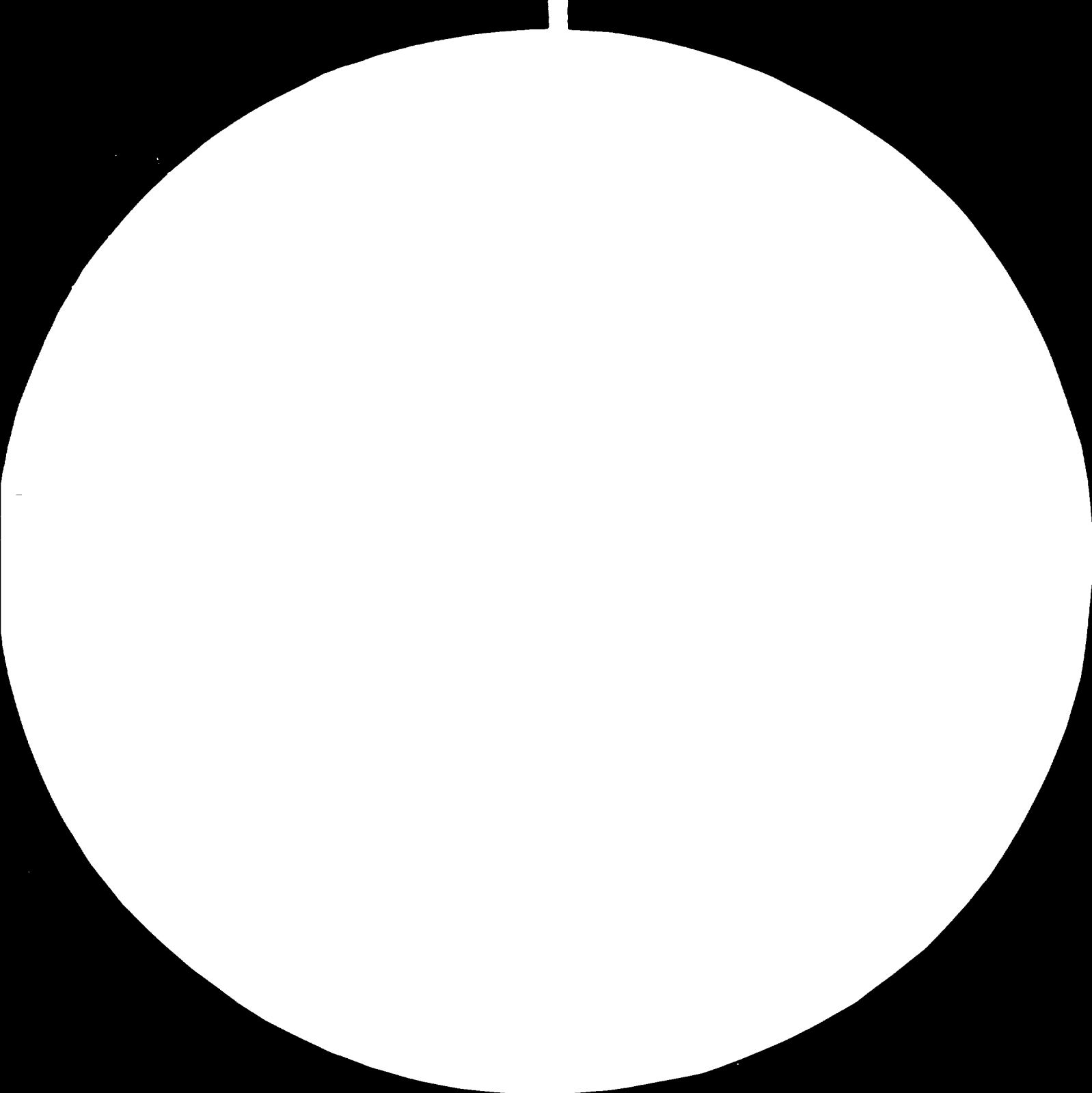

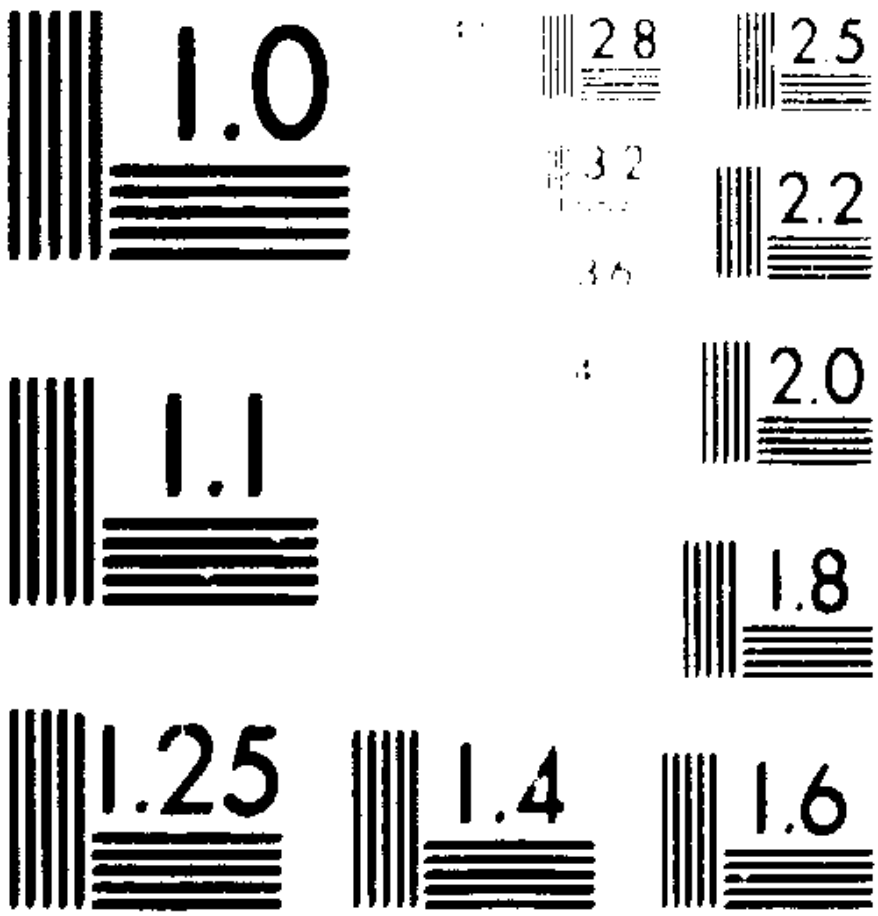

UNITED NATIONS

INDUSTRIAL DEVELOPMENT ORGANISATION

10544

Project DP/GRE/77/001

Innovation of Greek Industry, Role of Advanced Technologies and New Management Outlook

by

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C O N T E N T S

SUMMARY

Briefly stated purpose of this study was to indentify product areas so far outside the scope of the Greek industry which if exploited would cause significant advancement of technological knowledge in the country and would stimulate further development needed to narrow the technological gap between Greek industry and industries in the EEC countries. By definition the proposals would concern products requiring use of advanced technologies but the definition of advanced technologies, in the context of the Greek industry, was left to be determined during the study when quality of the Greek industry was analysed and trends of technology in the advanced countries examined. Having established the product areas and appropriate technologies the task of the study was then to propose measures which would encourage the industry to explore the recommended areas and to extend their technology scope.

The task was approached by first analysing performance of selected sectors of the Greek industry and by establishing their quality relative to EEC standards in terms of technology and major business management parameters. The results were then considered together with projected future demand for advanced technology products in order to identify product areas and their technologies which should form a part of the new industrial regime. Demands which the new regime could be expected to impose on available management skills were then reviewed in the light of management quality established earlier and recommendations of infrastructural support were drawn.

Analysis of performance has shown that lack of original technology, technological imbalance between the main and secondary industries and ineffective management were the main weaknesses of the industry. It was found that while the industry has to rely on foreign technology for major inputs, imported know-how was not adequately utilised in so far that little or no effort was made to use the acquired knowledge as a basis for further original development. This was more apparent among the potentially technology oriented industries than in the basic sectors.

The outdated attitude to technology was reflected in the performance of all management functions resulting in overall management efficiency being about half of an average performance in the EEC countries. Estimates of the chances of individual sectors to survive under conditions of full EEC membership were made to underline the urgency of some action to strengthen the industry.

Following the evaluation of quality of the industry three sectors were identified as advanced technology areas in the Greek context namely machine construction, packaging and industrial controls and were recommended for early accelerated development to offset the current imbalance among sectors. Further three sectors namely information communication/processing, energy management and environmental controls were recommended for special encouragement in longer term. Three technologies common to all recommended sectors namely precision engineering, electronics and plastics were recommended for special attention of industrial as well as educational authorities.

Finally recommendations were formulated concerning changes in the Greek industrial infrastructure and in management attitudes at the enterprise level.

On infrastructure side the main recommendation concerns establishment of an authority whose purpose should be to formulate necessary programme of industrial development and to be in a position to direct its implementation through technological and risk-sharing assistance to innovative entrepreneurs. Other major recommendations requiring direct Government action concern the confidence problem of the industry, better utilisation of public procurements for stimulation of technological progress, revision of the terms of reference of industrial development banks and promotion of quality of Greek products.

Recommendations concerning the industry deal with desirable changes of management outlook particularly with the necessity of creating an industrial technology base in Greece and with financial restructuring of enterprises. Also changes in attitude to innovation, greater selectivity in purchases of technology abroad and overall improvement of management efficiency are urged.

1. Introduction

Six years ago the authors of this report conducted sectoral study of the Greek Electronic Industry. The study concluded that the technology base of the sector and the quality of its management should be much improved to ensure satisfactory development. The study also pointed out that the Greek industrial infrastructure needed to be modernized to give the industry measure of support available in all industrialized countries.

Conclusions of the electronic study were of course applicable to most industrial sectors in Greece. Therefore when more recently projects of the Greek industry came into a new focus owing to Greek accession to the EEC it was thought that a project comparable in extent but technologically more broadly based than the electronics study should be commissioned to show a complete picture of the industry and to redefine the earlier recommendations in the broader context.

In addition it was felt that Greek industry has reached a stage when it should shift its orientation towards technologically more demanding products. As in Greek circumstances this would not be possible in all sectors, it was felt therefore, that policy should be formulated on sectors which should be selected for preferential encouragement and that levels of technology should also be defined at which accelerated development of the selected sectors should begin. With these considerations in view and on the basis of experience gained from the electronic industry study KETE defined terms of reference of the present project.

The project was sponsored by United Nations Industrial Development Organisation (UNIDO) and was counterparted by KEPE. The work was based on official statistical information, professional records of the consultant and information obtained during interviews in the industry and through contacts in government establishments.

2. GREEK INDUSTRY

In this section we shall first analyse quality and composition of those sectors of Greek industry considered relevant for the purpose of this study and then shall consider the results in the light of expected change of trading conditions due to the Greek accession to the EEC. By doing so we shall expose the weaknesses which have to be overcome by companies wishing to feel secure in the new environment.

Since the study is concerned only with higher technology products only certain sectors were analysed. They include five sectors which in the developed economies are traditional purveyors of higher technology products and five other sectors which depend on higher technology for their production means. In terms of standard industrial classification the first group includes plastics, metal products, machinery, electrical equipment and the motor industry and the second group food processing, beverages, textiles, chemicals and metallurgy.

The analysis was based on business ratios used by executives to measure performance of their operations. This technique consists of using ratios of selected items posted in business balance sheets as indicators of quality and comparing them with data representing agreed targets. Ratios of one company can be compared with ratios of another company to determine companies relative merits. When aggregate data of industrial sectors are available the method can be used for comparison of quality of sectors of different countries as indeed was done in the present case.

2.1. Analysis of Performance

To analyse the performance 18 performance ratios of the selected sectors were calculated and compared with corresponding ratios calculated for the same sectors of industry in Britain*. Comparisons revealed certain important differences common to all sectors indicating that analysis on national rather than sectoral basis will be more meaningful for formulation of a general picture. Therefore the sectoral ratios were aggregated in national averages and compiled in Table 2.1. on which our initial analysis will be based. Since however the sectoral comparisons may be of interest to some readers they have been included in the report and will be found in Appendix A.

Financial results are the ultimate measure of success,or lack of it of every enterprise and therefore it is logical to start analysis of industrial performance with study of profitability (P/S) and productivity of investment (S/CE). In Greece both amount only to a little over 1/3 of British performance. This indicates that Greek industry is very weak, that it will experience serious difficulties when it becomes exposed to the competitive pressures of the EEC environment and that therefore improvement of its performance is urgently needed. Inspection of other ratios of the table will point out the areas where appropriate improvements can be effected.

Most serious single cause of the weakness is the far too low level of equity (NW). It leads in the first instance to excessive long term

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* Comparison with British performance was chosen because data were available from consultant's records. It is acknowledged that British performance is below EEC average.

Table 2.1. Management structure of selected sectors

		GR	UK	
1. Structure of capital				
% of TA)				TA - Total Assets
FA	%	34	45	FA - Fixed Assets
ST	%	26	26	ST - Stocks (finished goods and work in progress)
LA	%	34	31	LA - Liquid Assets
NW	%	32	58	NW - Net Worth
D	%	21	8	D - Debt (long term borrowing)
CL	%	47	31	CL - Current Liabilities
2. Credit control				
CL/NW	%	151	56	
ST/NCA	times	2,36	0,93	NCA = LA + ST - CL
3. Financial performance				
P/CE	%	2,2	14,8	P - Profit
R/S	%	3,4	9,7	S - Sales
S/CE	times	0,65	1,53	CE - Capital Employed
4. Technical performance				
S/FA	times	2,28	2,91	
S/ST	times	2,79	5,23	
5. Labour management				
W/S	%	13,8	25,4	W - Wages and salaries
TA/W	times	11,6	4,94	

borrowings (D) and unecessary drain on profits becouse of heavy interest payments. It leads further to cash flow problems which in turn affect the rate of trading and therefore the productivity of industrial invesc-ment. Vicious circle of stagnation is then created where trading surplus is not adequate to finance growth of business after debt servicing obli-gations are met and poor productivity of capital makes industrial invest-ment not attractive to external financial sources. The extent to which Greek industry is afflicted by this problem is indicated in the table by high level of current liabilities (CL) and the magnitude of trade credit problems (ST/NCA).

Related to financial strength is financial stability and as the Greek companies are financially weak they are also correspondingly unstable. The measure of their instability is given by the CL/NW ratio regarded by analysts as the measure of creditworthyness. Greek ratios show the average creditworthyness to be only 1/3 of the creditworthyness in Britain and therefore the risk of collapse of an average Greek company must be regard-ded three times higher then the risk of its Britain counterpart (under British pre -1980 trading conditions). Full weight of the poor credit-worthyness will be felt when under changed trading conditions in the vake of full EEC membership emergency cash will be frequently needed to finance defensive measures but will not be available because of the poor credit rating. It must be expected therefore that numerous Greek companies will be pushed into liquidation by events under which business in EEC countries survives in comfort.

It is also interesting to note that difference between Greek and British indebtedness is almost the same as inversed difference in profitability. It could be implied therefore that if or when the percentage of equity of Greek companies is brought to levels usual in Britain the level of Greek profitability may also reach the British standard.

The level of involvement of banks in the Greek industry is indicative of the level of development of the Greek economic and social infrastrucure. It signifies on one hand absence of alternative sources of financing and on the other conservative attitudes of the Greek enterpreneurs. Development of an effective money market is in its infancy and is hampered by bureaucratic attitudes of authorities and officials concerned with its administration. So far it has made little impression on capital demand. At the same time however demand remains low because the family approach to enterpreneurship is still dominant in most Greek firms and with it distrust of involvement of strangers in the family business creates a reluctance towards open market financing. Prospects of an early change of the capital structure of the Greek industry seem therefore limited and the risk to a significant portion of the Greek industry from EEC induced changes remains considerable.

Remaining ratios in the table show that financial weakness of the Greek industry is accompanied by an all round low activity. Low level of investment in plant (FA) and intensive use of labour (TA/W) indicate that only low technology products are made. Half of the benefit of low wages in Greece appears to be lost due to the inefficient use of labour (W/S). Salesmanship (S/ST) appears only half as effective as in Britain. Lower utilisation of plant completes the picture.

One important difference between the Greek and British industries is not shown by the ratios however namely the excessive dependence of Greek industry on imported technology which adds yet another dimension to its vulnerability from competitive pressures. Too little appears to have been done in the past to use imported technology creatively as a basis for development of original know-how which will be needed for defensive flexibility in the face of future competition.

Although some of the weaknesses of the Greek industry shown by the foregoing analysis are of a circumstantial nature most of the problems have their roots in inadequate management. It was thought therefore that comparison of management performance in terms of major management functions would throw additional light on the situation and the sectoral ratios were used once more in preperation of Table 2.2 (see also Appendix B). The results were arranged as a matrix of functions and sectors and show Greek performance as percentages of comparable British data. Data in the penultimate line are averages of the respective columns and give a picture of management performance of an average Greek company.

The table shows that management of an average Greek company is only a little over half (54%) as effective as its British counterpart. It also confirms earlier findings that profitability and financial stability are the main problems of the Greek industry and the conspicuously low figures in Columns (5) and (8) emphesize the gravity of the situation. The surprisingly high technical parameters in Columns (1) and (2) need to be interpreted in terms of relative simplicity of products made in Greece and the high proportion of plants equipped on the basis of licensing

Table 2.2. Management Performance of Selected Sectors (1977)

Code	Sector	(1) Quality of plant	(2) Production methods	(3) Utilisation of plant	(4) Financial strength	(5) Financial stability	(6) Sales performance	(7) Labour productivity	(8) Profitability	(9) Productivity of capital	
20	Food processing	0,79	0,91	0,94	0,47	0,19	0,32	0,49	0,33	0,50	
21	Beverages	0,55	0,30	1,52	0,46	0,28	0,31	0,37	0,13	0,89	
23	Textiles	0,95	0,94	0,36	0,43	0,20	0,42	0,47	0,41	0,32	
30	Plastics	0,64	0,60	1,23	0,53	0,35	0,58	0,57	0,42	0,57	
31	Chemicals	0,85	0,37	0,79	0,72	0,65	0,66	0,33	0,11	0,57	
34	Basic metals	1,00	1,22	0,71	0,63	0,37	0,46	0,90	1,00	0,58	
35	Metal products	0,58	0,65	1,27	0,50	0,34	0,67	0,67	0,49	0,64	
36	Machinery	0,62	0,9	0,65	0,50	0,30	0,46	0,54	0,14	0,33	
37	Electrical equipment	0,81	0,83	0,58	0,56	0,33	0,61	0,60	loss	0,37	
38	Motor industry	1,12*	0,80	0,23	0,68	0,36	0,67	0,29	0,48	0,19	
	Greek averages	0,79	0,76	0,63	0,55	0,34	0,52	0,51	0,28	0,50	54%
	British reference	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	100%

* Includes shipbuilding

NOTE: Greek data used for calculation of the ratios in Tables 2.1. and 2.2. were taken from Development and Economic Status of Greek Industry published by Greek Ministry. Figures for 1977 were used. Professional records of the consultant were the source fo British data. These records were collected from public and private sourcess contacted during consultant's work. They cover period of seven years up to 1975 during which efficiency of British industry has shown mesurable increase. Therefore the tables must be considered as giving an optimistic picture of Greek performance.

agreements. If these factors could have been included in the ratio readings in Columns (1) and (2) would have been less favourable. Further more the table fails to account for the neglect of development of original technology which further debases overall rating of Greek management performance. The table therefore while useful gives rather optimistic picture.

Apart from giving an overall picture of quality of industrial management the data in Table 2.2. provide also information on strengths and weaknesses of individual sectors which will be used in Section 3 to determine the technologies and sectors which should be recommended for special encouragement. Prior to this the table was used to study the pecularities of the sectors to obtain broader view of the Greek industrial scene. Impressions obtained will be found in Appendix C.

2.2. Outlook

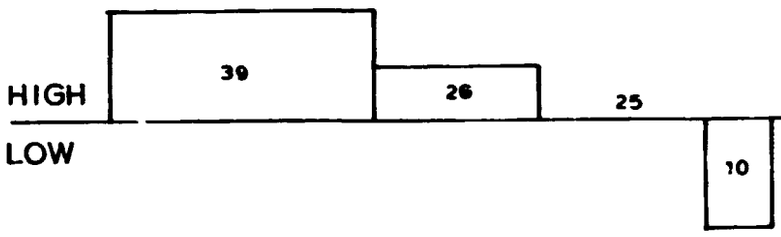
Having established that on average Greek companies are only half as efficient as their British (EEC) counterparts it is obvious that changes in the competitive environment which Greek membership of the EEC will bring about will lead to some changes in the structure of the Greek industry. Some companies will become more competitive through greater efficiency and improved quality of their products and other will fall by the wayside. Precise outcome is of course impossible to forecast but and idea of their vulnerabilities can be obtained by estimating combined effect of the strength of their technologies and the adaptability of their managements. For this purpose all sectors were analysed

in terms of size and foreign associations of enterprises listed in ICAP Trade Directory on assumption that size of an enterprise can be related to adaptability of its management and an association with foreign firm to strength of its technology. Enterprises were then classified under both parameters/in high, low and indeterminable vulnerability categories and the classifications were combined to obtain picture presented in graphical form in Table 2.3. Intermediate tables showing the categories in the sectors will be found in Appendix D.

The amount of risk in every sector as shown in the table is related to the area occupied by boxes which represent precentages of total output of sectors. Full amplitude boxes show full additive effect of both components while the half-amplidud boxes reflect presence of indeterminable risk groups. Zero-amplitude areas indicate risk half way between two extremes.

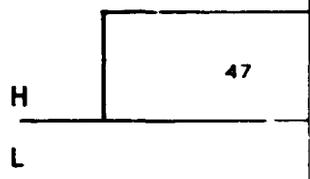
The table shows that food processing, textiles, metal products and plastics are sectors likely to be most affected by the expected changes. Over 60% of their output is shown at high risk. Food processing appears to be particularly badly placed with only 10% shown as reasonably safe. Plastics is the best in the group having about 1/3 of its output in the least exposed category mainly due to the consumer and packaging material groups in its composition. High vulnerability of the metal products sector seems the result of its general technological weakness. Slightly better position of textiles is due to large number of small companies in the sector which because of the local character of their business are not considered to be at high risk.

FOOD PROCESSING

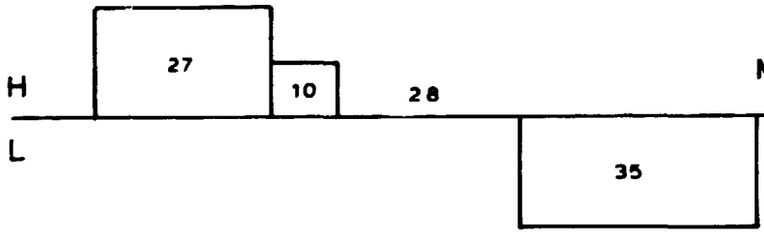


HIGH - 39 %
MEDIUM HIGH - 26 %
AVERAGE - 25 %
LOW - 10 %

PLASTICS

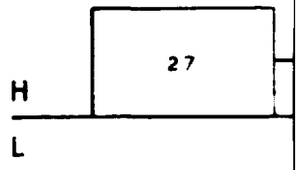


BEVERAGES

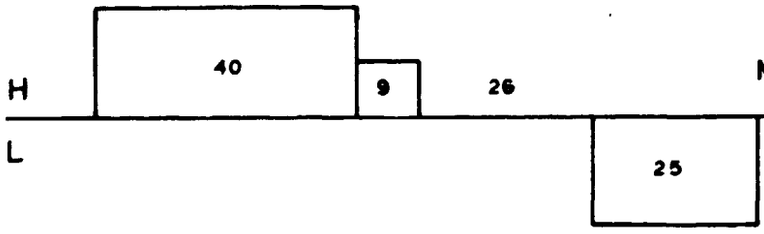


HIGH - 27 %
MEDIUM HIGH - 10 %
AVERAGE - 22 %
LOW - 35 %

CHEMICALS

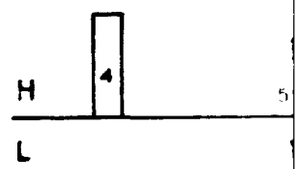


TEXTILES



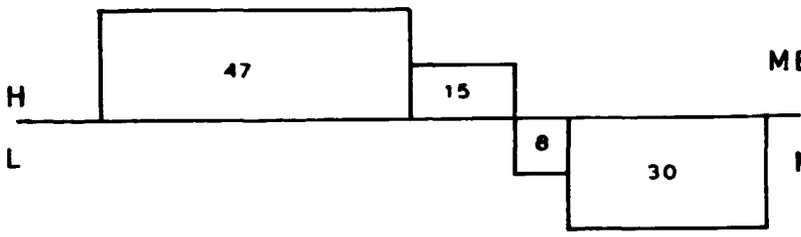
HIGH - 40 %
MEDIUM HIGH - 9 %
AVERAGE - 26 %
LOW - 25 %

BASIC METALS



PLASTICS

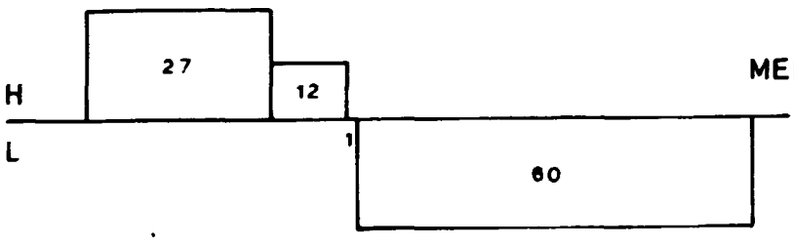
HIGH - 39 %
M HIGH - 26 %
ERAGE - 25 %
LOW - 10 %



HIGH - 47 %
MEDIUM HIGH - 15 %
AVERAGE - 0
MEDIUM LOW - 8 %
LOW - 30 %

CHEMICALS

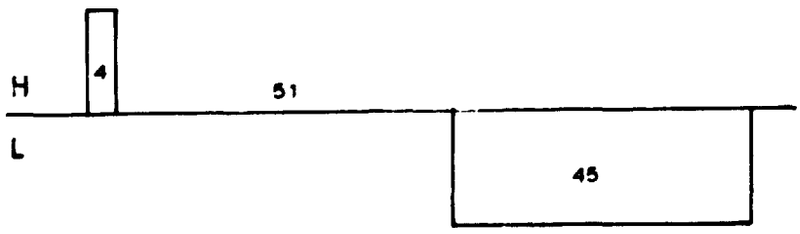
HIGH - 27 %
M HIGH - 10 %
ERAGE - 22 %
LOW - 35 %



HIGH - 27 %
MEDIUM HIGH - 12 %
AVERAGE - 1 %
LOW - 60 %

BASIC METALS

HIGH - 40 %
I HIGH - 9 %
ERAGE - 26 %
LOW - 25 %

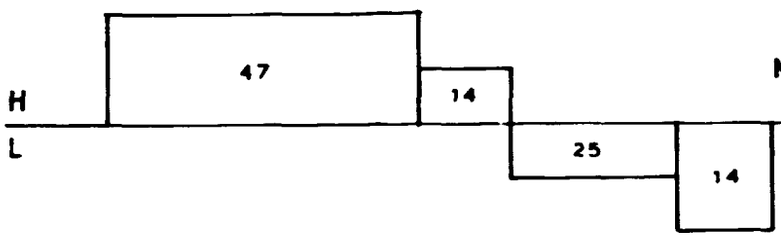


HIGH - 4 %
AVERAGE - 51 %
LOW - 45 %

TABLE 2.3 RISK RATING OF SECTORS

METAL PRODUCTS/MACHINERY

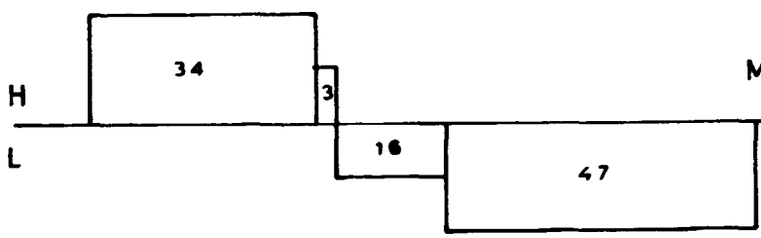
HIGH-47%
HIGH-15%
RAGE - 0
M LOW - 8%
LOW - 30%



HIGH - 47 %
MEDIUM HIGH - 14 %
AVERAGE - 0
MEDIUM LOW - 25%
LOW - 14 %

ELECTRICAL EQUIPMENT

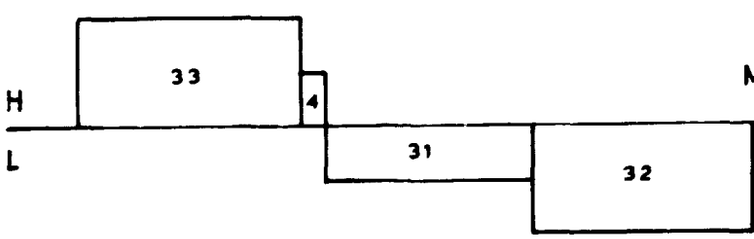
HIGH - 27 %
HIGH - 12 %
RAGE - 1%
LOW - 60%



HIGH - 34%
MEDIUM HIGH - 3%
AVERAGE - 0
MEDIUM LOW - 16 %
LOW - 47 %

MOTOR INDUSTRY

HIGH - 4 %
RAGE - 51%
LOW - 45%



HIGH - 33 %
MEDIUM HIGH - 4 %
AVERAGE - 0
MEDIUM LOW - 31 %
LOW - 32%

SECTION 3

At the other end of the picture basic metals appear very sound. Only a few marginal manufacturer seem to be at risk. Chemicals and electrical equipment are the next best placed sectors with about 2/3 of their output in the safer areas largely due to international associations of the larger companies. In beverages actual position is probably better than our picture indicates because by our criteria most of the wine industry falls in the high risk area whereas conditions and future prospects do not bear it out. On the other hand our picture of the motor industry probably errs on the optimistic side because of the ever increasing domination of the world markets by a small group of multinational manufacturers.

This picture gives some idea of the amount of casulties Greek industry is likely to suffer in the next few years. Companies which will disappear will be mostly those which were established to derive quick high profits for their owners from market opportunities without much regard for industrial quality. They will not be a real loss to the economy and their departure may in fact serve the industry well in terms of improved business ethics and financial discipline. Employment losses which such closures will create will be partly offset by employment created by new companies entering business and the residual unemployment will have to be dealt with by re-training programmes and social measures increasingly in evidence in industrialised countries to counter the effects of the current re-adjustment of world economy.

The surviving companies will be much changed. They will have to undergo a transformation from their present character of essentially minimum technology workshops into enterprises possessing enough in-house

technology to sustain continous invovations to their products and methods of production in order to respond to competitive pressures of an unprotected business environment. In addition to new technological capability the new look companies will have to achieve productivity and profitability levels much above the current performance and will have to learn how to create new markets and how to achieve deeper penetration of the existing ones. Such improvements will require the companies to acquire new management outlook apart from extra technology.

Technology and management skills are an essential component of assets of a company and like machinery, stocks and the rest of tangible assets, cost money. The higher the technology the more investment needs to go in it. Therefore the new look companies will have to be prepared to invest in their business at levels far in excess of investments customary so far. In future up to 15% of turnover may have to be spent annually on investing in the intelectual contents of industrial business to ensure that enough in-house knowledge is available within firms to cope with competitive pressures and to be in a position to take ready advantage of market opportunities as they occur. Moreover the concept of investment in technology will have to become established not only at the company level but also in the minds of those operating financial institutions where so far little understanding of financial requirements of technology based industry exists.

While industrial output in Greece may initially shrink in the early years of Greek membership of the EEC as a result of/the demise of the weaker members of the industrial community expansion from a new base should be

expected later as new enterpreneurs come forward with new ideas and ventures. In the new atmosphere harsher as it may be but more favourable to growth of technology oriented industries new type ventures can be expected to give the transformation of the Greek industry another twist. Recent industrial history abounds with examples of small countries developing new successful industries based on good technology and quality of their products and Greece may yet join their numbers.

It is true of course that countries like Denmark or Finland in Europe and Taiwan or Korea in Asia built their technology base during period of unprecidented economic growth while Greece is entering this stage at a time when the validity of established economic and social concepts on which world industrial prosperity was built are beginning to be questioned and business confidence is being eroded. With less confidence all around the task of transformation of Greek industry will be more difficult but by no means impossible. It does mean however that stronger infrastructural support will have to be given than was needed to achieve industrialisation miracles in Europe and Asia during the previous decades.

The needed support should come not only as assistance with provision of tangible assets but also in form of capital provided to finance growth of in-house technology and acquisition of technological and commercial information. The facility should be available to all companies new and established ones but support should be granted selectively only to those applicants able to establish the merit of their requests. Preferential treatment should be given to companies working in prefered technological sectors in order to guide industrial development into preferred areas considered

particularly appropriate for the Greek economy. Such concentration of investment was one of the reasons behind the Danish, Japanese and other success stories.

As very few if any Greek companies will ever be able to compete internationally in quantity markets their approach to prosperity should be through concentration on products of special technological requirements which by virtue of modest markets or their pecularities are of no interest to their bigger international competitors.

Import of technology will remain an important source of know-how. However unlike in the past the new look company will assimilate the essence of imported knowledge to build further on it on its own.

Role of mergers in the transformation of the industry needs also to be mentioned. The fact that as the level of technology increases so does the amount of money needed in business was already mentioned and it is obvious therefore that with the increasing technological needs also the size of the company needs to increase so that larger funds become available. Mergers can provide shortcuts to the problem of accelerated growth and can be used therefore as powerful tool of rapid build-up of industrial units possessing sufficient resources to finance technology and innovation at the rate needed in the new environment. Encouragement of mergers must therefore be a part of the new look policy.

In the following paragraphs we shall examine in some detail the points mentioned here and shall propose measures which will be needed to affect the required changes.

3. ADVANCED TECHNOLOGY SECTORS

As mentioned in the Introduction one of the tasks of this study was to identify sectors in the Greek industry which should be marked for preferential encouragement and accelerated technological advancement. This will be done in this section.

In search for industries which should be recommended for special promotion we returned to Table 2.2. from which Table 3.1. was constructed. It will be observed that this table was arranged for comparison of sectors based on natural resources of the country with those based on technical skills. The table shows that the resource oriented industries are technologically stronger than the skills based sectors and that at the same time they are financially less stable. In fact the reverse should be the case.

The reasons for this situation are the usual problems of industrial development stemming from vertical structuring of basic industries inevitable during early stages of industrialisation when services of technology oriented sectors are not available. Of necessity their financial resources become then spread over a wide field of activities auxiliary to the main stream of their technical orientation. Such situation is tolerable while their products remain simple and do not require heavy commitements to finance sophisticated technology and complex production. When however requirements of their markets and competitive pressures force transition towards technologically more advanced products greater concentration of resources in the main stream of business is needed and the vertical structure has to be abandoned. At that time need arises for basic industries to turn to the skills based sectors to obtain services which up to that time were available within their vertical structures. If this does not

Table 3.1.: Comparision of Resource + Technology Oriented Industries

Sectors		Technology rating		Stability		Total employed
		Sectoral*	Average	Sectoral**	Average	
Resource oriented	Basic metals	1,11	0,96	0,37	0,25	10.000
	Textiles	0,95		0,20		60.000
	Food processing	0,85		0,19		36.000
Skills oriented	Electronics	0,87	0,72	0,33	0,33	4.000
	Machinery	0,70		0,32		7.000
	Plastics	0,62		0,35		8.000

* Average of Columus (1) and (2) of Table 2.2.

** Column (5) of Table 2.2.

take place available financial resources become overstretched causing financial instability which brings with it increased risk of collapse at times of competitive pressures and other disturbances of markets.

Our table shows that in Greece this transition has not taken place or has not gone far enough. Basic industries are seen to be severely financially strained and the skills based sectors remain weak and inadequate to provide the needed services. It is obvious therefore that in the immediate future priority must be given to accelerated development of skills based industries to ensure that missing services become available so as to allow those industries which form the backbone of Greek industrial structure to concentrate their attention on remaining competitive in their respective fields.

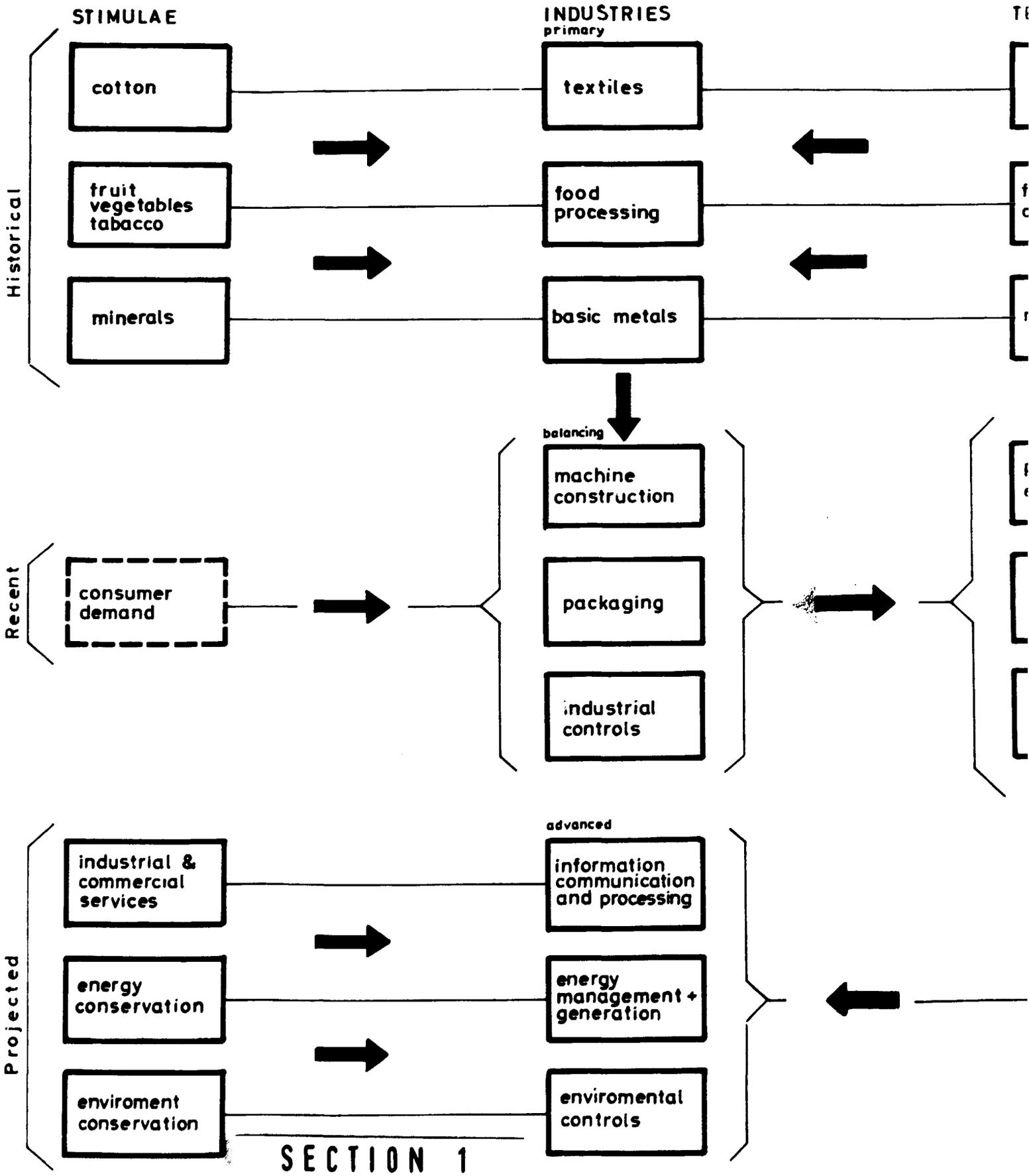
Skills oriented sectors shown in Table 3.1. each comprise a wide range of industries and it is obvious therefore that encouragement of accelerated development will have to be given only to a selected few in order to concentrate Greek technological advancement on a narrow front commensurable with national resources. Furthermore industries which should be encouraged should meet two important criteria namely they should be immediately useful by providing the services needed by the basic industries and at the same time cause advancement of those skills which in long run would open way to production and marketing of new advanced products for which markets will materialise in foreseable future.

With these parameters in mind results of the evaluation of Greek industry were considered together with trends of world technology and their related markets (see Appendix E) and the conclusion was reached that machine construction packaging industry and industrial control systems would best meet the stated conditions. Their products can be immediately useful to the basic industries

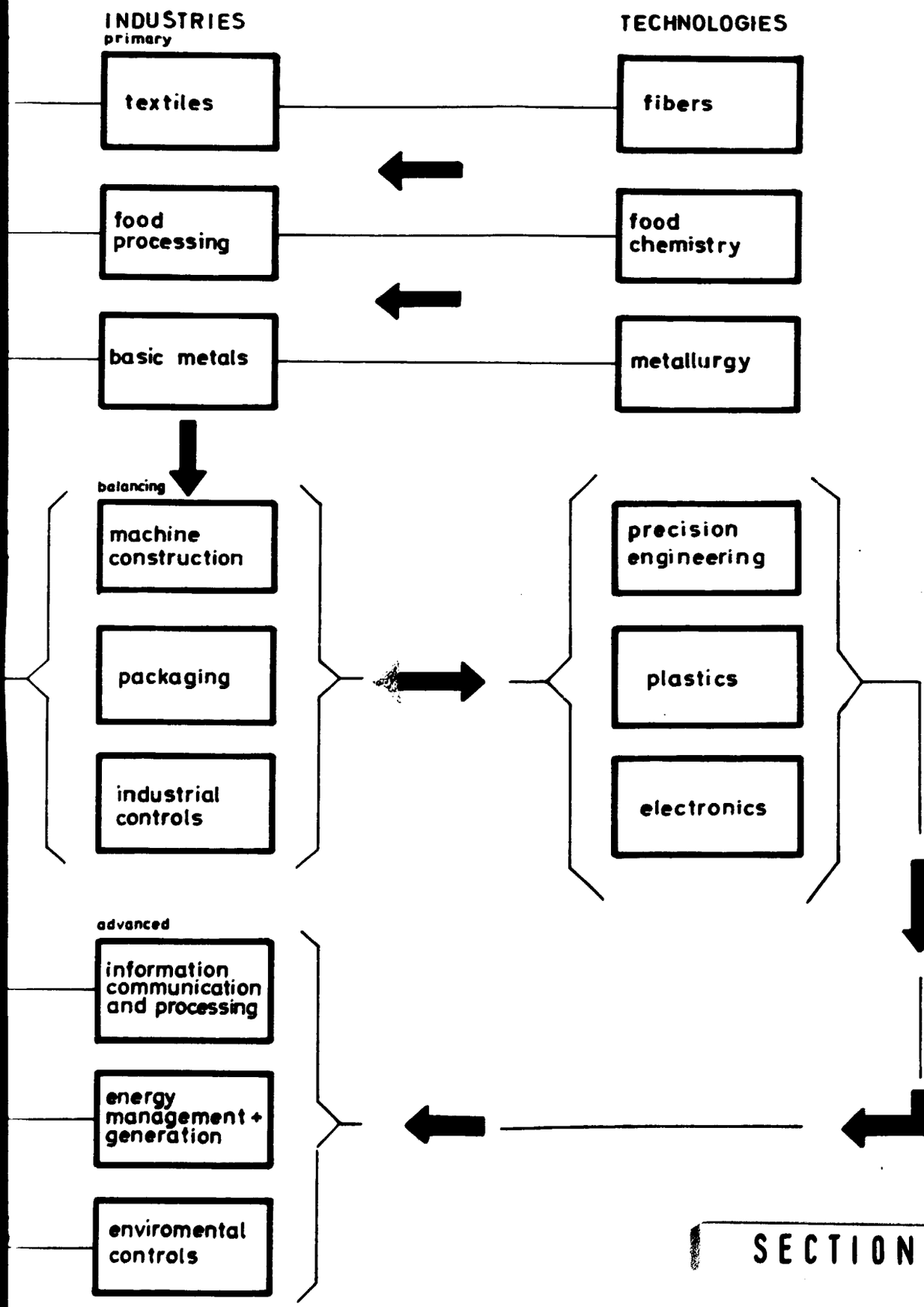
and the skills which they would generate should be directly applicable to the advanced products in which Greek industry could specialise in the future. The skills which Greek industry particularly needs and which will be emphesised by the selected industries are in precision engineering and in electronic and plastic technologies. Logic of this argument is shown by the diagram in Fig.3.1.

When considering sectors for inclusion in Table 3.1. chemicals and beverages were at first included in the first group and metal products and motor industry in the second. However the first two sectors were eliminated on account of their uneven mix which distorts their data and in the second group, motor industry was considered outside further interest because of its transnational character and metal products because of irrelevance of its technology to long term technological advancement of the country. For the same reason only the electronic component of electrical sector was taken into account.

Fig. 3.1: Progression towards Advanced Technology Industries in Greec



Advanced Technology Industries in Greece



4. CONDITIONS FOR TECHNOLOGICAL ADVANCEMENT

In the previous section we established the direction where Greek industrial development should aim. We established that the thrust should be towards development of balancing industries and therefore towards greater technological maturity. In this section we shall deal with innovations which are needed at various levels of industrial life of the country as preconditions of future progress. They concern change of industrial management concepts, change of approach to industrial investment, easier availability of technical and related information and points of general economic climate of the country.

4.1. Management Outlook

Genericaly industry is a grouping of individual enterprises run by their managements. The character of an industry is created by the behaviour of the constituent enterprises which in turn is determined by the policies their managements follow and the decisions they take. Therefore if today Greek industry is hardly more than a collection of manufacturing workshops dependent on external technological input rather than a coherent grouping of enterprises unified by sense of technological professionalism it is due to the past policies prevailing in the Greek industries which saw no need for investment in independent technological knowledge. This situation is not unique. It is a phase of industrial development through which many countries have passed on their way to greater industrial prosperity. It suits a particularly stage of economic development when industrial production per se is more important than the quality of goods produced and it can persist as long as the markets of the industry are protected by tariff walls. Sooner

or late however this infancy stage has to give way to a more mature way of industrial life when for political or other reasons tariff walls come down and enterprises have to learn to defend themselves by innovative changes. When this point is reached the onesided dependence on external sources of technology has to be augmented by home grown know-how. This is where Greek industry stands today.

The idea of home grown technology is a new concept for most Greek manufacturers and needs to be established in their thinking as the most important condition of future survival. Time when imported technology was wastefully used for production purposes only, needs to be firmly commited to posterity and in the coming years more and more managements must start to regard it not only as a source of manufacturing instructions but also as a base of independent technological work leading to modifications and improvements of the licenced products and to their eventual replacement by new **independently** derived products.

To this end most companies will have to accept the necessity of employing professionally qualified engineers in far greater numbers than so far and to provide facilities and regular budgets to support their work. In western countries anything up to 15% of companies incomes is spent on this purpose. In Greece more modest expenditure may initially suffice but it will have to be established as regular expenditure in companies budgets and the cost will have to be included in the pricing structure of finished products in the same way as they are treated in the industrialised countries. If then Greek prices become uncompetitive manufacturing costs will have to be reduced through greater management efficiency for which there is an

ample scope as we have seen in Section 2.

Introduction of higher technologies will not affect only the technical side of operations of companies however. Managements will have to change many other established concepts and practices. Thus for example they will have to adopt new methods of financial management to cope with the more complex investment patterns resulting from the long term character of technology investments. With investments commited over longer periods greater need for business planning and for greater management discipline will arise. As investment periods increase with the rising levels of technology ever increasing demands on the quality of management will be made. Therefore introduction of higher technologies can be ceen as a tip of an iceberg of changes affecting in due course the whole management structure of companies and it will be only those enterprises where managements are found willing and capable to cope with these changes which will succeed in the new competitive environment of the future.

It can be argued that at times of persistent high rates of inflation the proposed investments cannot be found or would be at best impractical. The answer to such arguments is that it depends whether short or long term view is taken. Those who take the short term view invest their money in the real estate of Athens. Those who are more farsighted and who are more confident of their own capabilities will invest in the technology of their companies. Time is not very far when in the vake of Greek membership of the EEC such investments will be well recognised by financial analysts when valuations of companies are made for issue of shares or on take-over bids. Those who invested in their technology will be the winners.

4.2. Availability of Capital

Technological knowledge is a commodity with a price. The higher the technology the higher the price and the greater investments are needed to make use of it. Cost of acquiring technology was stressed in the previous sub-section. Here we shall stress the cost of its handling.

When products are technologically simple they can be made quickly by simple means and the amount of working capital for unit output is low. As the complexity of products increases, the level of required working capital increases too. More advanced products require greater stocks of components, products need to spend more time on the production line etc, etc. Reasons for extra capital will vary with particular products but whatever they are, the fact is that as the technology of products increases the ratio of working capital to other assets changes to the point when working capital may become the larger of the two. In some industries like in computers for instance the amount of working capital may exceed the level of other assets several times.

Effects of higher technology on the change of financial needs of industry remain unappreciated by the financial authorities in Greece. Institutions still see financial needs of the industry in the light of 30 years ago when new factory to manufacture simple items like screws was an industrial event. They appear oblivious to the change which has taken place since and seem ignorant of the nature of technological development. As a consequence Greek companies attempting to move with the times and needing more working capital to fiance higher technology products are finding themselves

unable to raise loans from the banks since the banks have not comprehended the role of higher working capital in modern industry. This ignorance needs to be corrected if progress towards higher technology is to be made.

Equally important is the exaggerated orientation of industrial financing towards new industries. Such singlemindedness was understandable again some 30 years ago when there was hardly any industry in the country. Today the situation is different however. While the need to encourage new enterprises remains there is also need to support the growth of the existing ones which need additional investments to support their more demanding technologies. Existing investment policies take no notice of this situation which if not checked will lead to technological stagnation at the time when innovation through higher technologies becomes particularly vital for many Greek companies.

Greek institutional financing falls short of the needs of the industry on yet another point namely on the very conservative approach to investment risks. By providing loans only against real estate guarantees and ignoring technological and entrepreneurial qualities of companies seeking loans the system fails to provide true venture capital without which technological growth is not possible. This conservative attitude can perhaps be understood where commercial banks are concerned but are singularly counterproductive in the case of ETVA and ETEVA which by the nature of their purpose should show totally different attitude. The way these two organisations operate makes no difference between their terms and the terms offered by ordinary banks. Therefore with money market in its infancy Greek industry has no recourse to flexible financing of progressive ventures.

It could be argued that once Greece is member of the Community, EEC banks may fill the gap and that therefore the situation is likely to be corrected without any specific action of the Greek Government. While this could be assumed it is hard to see any enthusiasm of foreign banks to do business with Greek borrowers whose equity/debt ratio is about three times worse than the ratios of customers with whom they are used to deal in other EEC countries. Therefore the future of the Greek industry is likely to remain in the hands of the Greek Government and the rate of progress towards higher technology will much depend on the measures the Government takes. If the Government chooses to ignore the situation the progress will be very slow if any. Greek industry is simply in no position to finance development of its technology unaided since the surpluses which should generate funds for such development are diverted in the present circumstances to the banks to service excessive borrowings.

Apart from the problems just discussed companies in some sectors suffer an additional difficulty of having to finance the trade which distributes their products. The practice seems particularly frequent in the consumer goods sectors where months long credits to the traders create serious additional diversion of funds which should be used for investment in technology and growth. This appears yet another case of infrastructural weakness which calls for corrective action.

4.3. Technology Atmosphere

Apart from forward oriented management outlook and availability of capital, pride in technological achievement is an additional force which drives

technological advancement in industrialised countries. Not surprisingly there is far too little of this feeling in Greece as presence of professional engineers in industry is limited and their professional organisation lacks influence. Therefore some focal point(s) of advanced industrial technology is (are) needed where engineers working in company confidential environments could exchange and compare practical experience at professional level and establish themselves as influential pressure group(s) with industrial leaders and the Government to help to create a 'technology atmosphere' in the Greek industrial life.

The focal point(s) could grow out of present academic institutions providing that the institutions were prepared to re-mould themselves on the pattern of technical universities in industrialised countries. They would have to shed their concept of splendid exclusiveness and their bureaucratic practices to be able to play more constructive role. Alternatively the new infractructural authority proposed in Section 7 could become the focal point. However whatever the form the focal point(s) should be so constituted as to create steady but at all times realistic pull on technological advancements at enterprise level. The influence should be continuously above the current state of technology in Greece but the amount of pressure should always remain within the absorption capacity of the industry. Main areas of activities should be the key technologies identified in Section 3 namely presicion engineering, plastics and electronics.

4.4. Industrial Intelligence

Whatever progress towards home grown technology may materialize, dependance on foreign technology cannot be eliminated. Imports of technology play im-

portant role in even the most developed countires filling gaps in product ranges which would be uneconomical to cover through local effort. For smaller or less developed countries with only limited resources imports of technology are essential means of achieving balance between the narrow fields in which they can afford to finance original development and broader requirements of their industries. Technology imports will therefore remain an important source of know-how in Greece though in the future emphasis will need to be on its use for developemtn of local technological base. This aspect will complicate negotiations of future licencing agreements and suitable licensors will be more difficult to find.

Buying technology is like shopping for anything else and the knowledge of the market is important. In industrially mature countries large companies keep dossiers on potential technology sources to ensure best buy when occassions arise and smaller companies buy relevant information from data banks operated by government agencies or as private ventures. In Greece there is no such information available and in the past purchases were made on the basis of more or less casual contacts rather than on the basis of informed choice. To improve the situation technology intelligence centre needs to be set up within the programme of encouragement of higher technologies to provide the needed information. Accordingly provision was made in the concept of the new infrastructural authority recommended in Section 7 for establishment of a data bank within its organisation. Concept of possible data bank is described in Appendix F.

NOTE

Since writing this sub-paragraph/activities of the Documentation Department of the Greek Productivity Centre came to the knowledge of the authors. Time has not permitted to compare the activities with the information flow requirements described in this document but it would seem that activities of the Department could be modified to accommodate our proposals should these not be adequatly covered by its present work.

4.5. Role of the Government

It should be obvious from what has been said so far that the rate of modernisation of the Greek industry will depend on how much Greek Government decides to do about it. Investment policies of the banks and setting up of organisations to promote technology will depend directly on government policies and even the necessary change of management outlook at enterprise level can be much influenced by government actions. This however is not all. Government will also have to create trading conditions of greater stability than the industry experienced in recent years before serious progress towards higher technology can take place. Also procurement policies of its own departments and those of public authorities should be changed to use public hardware requirements as stimulants of technological development of the Greek industry to a greater degree than so far.

Importance of trading stability for innovation will be appreciated when it is realised that it is not possible for a prudent manufacturer to expose himself to risks and uncertainties which innovations involve unless he can consider them against predictable results of his routine operations. Therefore government actions must ensure trading stability

before innovative investments become practical. Frequent reversals of policies which have been disturbing conditions of trade in Greece for some time created in fact powerful dissincentives for any innovative investment. The situation calls for urgent reappraisal and more considered actions by the Government in the future.

Picture of use of public procurements as stimulants of industrial development is a picture of wasted opportunities. Whereas in all industrialised countries the strength of industrial technology was built on opportunities created by public procurements in Greece such opportunities have been largely missed because of the preference of the procuring authorities to buy equipments of foreign origin. It would be most regretable if this practice was not checked in future. Public procurements will become encreasingly important for technological advance of Greek industry as the technology level of its products rises.

5. PRODUCT PROPOSALS

We have concluded in the previous sections that apart from new managerial outllok and re-orientation of infrastructural support the Greek industry needs to master three key technologies namely precision engineering, plastics and electronics to a far greater degree than hitherto as the first step towards greater technological emancipation. We also thought that this should be achieved through an early emphesis on encouregement of balancing industries because of the beneficial effect their growth should have on further development of primary sectors. We however also thought that this emphesis should not be to the exclusion of advanced sectors where parallel encouragement should also be given in cases when opportunities and enterpreneurial skills promise technological progress through successful ventures. In this section threfore we shall examine all sectors earmarked earlier (Fig.3.1.) for special attention and shall attempt to identify products and activities which should be encouraged to contribute effectively to long term technological growth while also promising commercially sound investments. It has to be stressed however that all proposals made here are no more than informed conjectures since no market research was part of the study and that therefore full market evaluation will be needed before any of them can be seriously taken up.

5.1. Machine Construction

This industry plays the principal role in the development of precision engineering skills which are increasingly needed by all sectors of industry as the quality of their products rises. Without these skills no progress towards higher technology is possible.

From the results of our analysis of the Greek industry it appears that in Greece precision engineering skills are of only limited quality and that those which exist are not properly utilised. Instead opportunities for precision engineering products created by requirements of other sectors of the Greek industry benefit imported products. The situation therefore calls for serious re-appraisal and for long term development programme to create new level of skills and technology which could then creatively interact with technologies of other sectors to produce industrial advancement along a broad front. Such programme requiring say five to seven years to produce results could not however be supported by the industry alone and would require government sponsorship and organisation specially appointed to implement it. Since at present there is no organisation in Greece which could undertake the task proposal will be made in Sections 6 and 7 to establish it.

Ideally programme of development of precision enginering skills should be implemented through sponsored development of a range of proprietory Greek machine tools starting say with simple drilling machines and progressing to numerically controled automata and machining centres. However the size of the Greek market and the market conditions for machine tools world wide impose severe practical constraits on such approach and are likely to limit its scope in terms of commercially promising machines to the point where its usefulness could be called in question. Therefore full cost analysis of this approach coupled with close market investigations is needed before practical programme could be conceived.

Considering these limitations, sponsorship of packaging machinery discussed in the next sub-section could offer an alternative since precision engineering plays an important role also in that sector.

Although development of precision engineering skills could be served by a packaging industry programme this approach would not have the same balancing effect and could therefore be coupled with limited objective programmes serving machine construction more directly.

One such programme could concern production of original Greek single and multi-blade cutting tools for metal and stone working applications. Reconditioning and modernisation of expensive obsolescent and obsolete textile machinery recovered from the manufactures could offer another approach. Further possibilities could no doubt be found.

In parallel with the long term multi-product programmes single-product ventures could be sponsored when opportunities arose. For example electric power tools with their attachements and a range of electrical welding equipment/both/seem to offer immediate possibilities. Also selected items of construction industry machinery could be considered for early sponsorship.

5.2. Packaging

Packaging industry depends almost equally on all three key technologies identified earlier. It depends on precision engineering for design and construction of its specialised machinery, on plastic technology for

packaging materials and on electronics for functional controls. Its encouragement offers therefore an excellent opportunity for allround technological progress.

Packaging industry also provides vital services for food processing and other consumer industries important for Greek economy. So far these services have not been available in Greece since this sector does not exist in the country in any recognisable form and the packaging problems are dealt with on an ad hoc basis by the manufacturers of the packaged products themselves with notable lack of professionalism and often demaging effect on consumer appeal of their products.

Encouragement to develop packaging industry in Greece as a sector in its own right would therefore serve not only long term programme of developing the key technologies in the country but it would also meet real short term needs of the existing industries.

As in the case of machine construction industry implementation of a development programme is seen as infrastructural responsibility and its implementation would logically be the responsibility of the new development authority mentioned in the previous sub-section.

Development programme of the packaging industry should start with a analysis of packaging techniques and their relevance to various industries in Greece. Similarities between the requirements of manufacturers of different products should lead to identification of items of packaging machinery best suited for sponsored production in Greece. Relatively

simple machines performing labelling, filling or wrapping would probably be the early candidates for early Greek production.

Apart from the packaging machinery itself packaging industry programme would also cover design and production of packaging items such as wraps, trays, containers, palletising boxes etc of suitable cost and appearance. To this end design and construction of injection moulding presses and plastics extrusion machinery and their tools would come within the scope of the programme to the benefit of the whole of the plastics industry in Greece.

The programme would also need to concern itself with properties of materials from which packaging items are made. General public awarness of environmental degradation caused by plastic refuse is changing social acceptability of many packaging items used in the past because of their weather resistant characteristics. Substitutes therefore will have to be found or new forms of packaging engineered or even new weather degradable materials developed. Uses of plastic-aluminium laminates which could be of considerable significance to Greek industry could come into prominance in this connection. Also possibilities of recycling used packaging items should be studied.

Stimulation of electronic technology which packaging industry also generates because of the control requirements of its machinery falls within the scope of industrial controls and will therefore be covered in the following sub-section.

5.3. Industrial Controls

Most items of advanced hardware incorporate control facilities of some kind as part of their integral design. Familiarity with industrial control techniques needs therefore to complement every expertise aspiring towards higher technologies. Modern industrial controls are encreasingly based on electronic technology. Encouragement of the sector can therefore serve the future of the Greek industry in two ways; by creation of services which will be increasingly required by other industrial sectors and by laying foundations of technology base which will have strong effect on industrial development in the future.

Because of the characteristics of modern electronic technology Greek development programme in this sector should concentrate on familiarisation with functional moduli available from international manufacturers and on their applications in control systems. Skills also should be acquired in thick and thin film techniques to deal with circuit requirements for which ready made moduli offered no solution. Initial concentration on controls suitable for packaging and machine construction should give way in time to general applications in all industries. Should the idea of reconditioning of textile machinery as part of the precision engineering programme be taken up considerable scope for early specialisation would open. Scope also could open for sponsorship of special test equipment early in the programme since regular work would require complex tests and measurments to be performed causing instrument expertise to accummulate.

To develop the sector and its technology long term programme comparable to programmes proposed for the two sectors discussed earlier will be required. Its orientation should be complementary with their aims. All three programmes should threrefore become the responsibility of the new technology development authority.

5.4. Information Communication and Processing

Until recently communications and data processing were two distinct industries though both based on electronic technology. Development of integrated circuits and new system concepts of electronic hardware changed however this division and started process of merging the two industries into a single high technology sector and a single market.

Sales of communication equipment have long tradition in Greece and inspite of the domination by multinational companies of this market some technological experience exists in Greece in a wider field. Sales of data processing equipment on the other hand have been limited because the systems based on the older technology were too large and expensive for the generally low level of economic activity in the country. This however is expected to change.

Convergence of the two classes of hardware and the consequent emergence of cheap dual function equipment will open access to numerous communication/information processing applications which as separate functions could not have been economically met in the past. This and the low cost of the new equipments will open new significant market on which new advanced

technology sector of the Greek industry could be built. Increased economic activity resulting from the Greek membership of the EEC should provide an additional boost to this development.

Combination of technological experience built on the basis of the programmes discussed in the previous sub-sections together with the communication know-how available in the country should be the key to the development of this sector. Like in the case of industrial controls the hardware will rely on integrated technology modular sub-assemblies but functional design of individual items of equipment will require broader conceptual understranding of systems they were designed to serve. New system engineering concepts will therefore to be learned opening further technological horizons in Greece.

Very wide range of products comes within the competence of this sector though great many will not be practical in the Greek context either for technical or commercial reasons. But the width of the field will give opportunities for a number of characteristic products aimed at narrow market slots. Clever design, superiority of performance or price or orientation towards pecularities of the local market are the points on which Greek manufacturers could enter the field. Rationalisation of work in government departments and in offices of public authorities could be particularly rewarding source of ideas for special equipment ventures. Bulk of application should come however from the industry and commerce. Up-dating of private communication facilities, need for better financial control, encreasing volumes of commercial information etc will usher the demand.

Development and marketing costs of equipment in this category will be considereable and infrastructural incentives will be needed to encourage enterepreneurs to look for business in this new field and to risk investment in its products. Services of the new development authority should again meet this need. Incentives which it should offer are discribed in Section 7.

While focusing on the new opportunities which the convergence of communication and data processing technologies will create the traditional communication field should not be everlooked particularly as the requirements of OTE are potentially powerful vehicle of progress. Modernisation and extentions of the line switching plant, call for additional equipment to encrease the capacity of transmission lines and the growing use of mobile communication systems will be continuously offering opportunities. It is regretable that so far OTE could not make its requirements a more effective vehicle of local technological progress. It is to be hoped that more perhaps will be done in the future.

5.5. Environmental Control

Due to rapidly deteriorating environmental conditions presure has grown in the world to reverse the trend. Concepts of environmental quality have been created and measures to stop and/or prevent pollution defined. To ensure complience analytical instruments are needed at the source and monitors placed in the environment. Both equipments depend on techniques related to industrial controls and on conceptual designs bordering on communication/processing hardware. Enviromental controls offer therefore

natural extention of activities recommended in the previous sub-sections.

Related to equipment designed to control open air pollution is equipment to control the quality of environment in factories and other situations where employees may be exposed to conditions constituting risk to their health. With increasing awareness of business to its social responsibilities the range of applications and the demand for this type of equipment is rapidly increasing. This will offer opportunities for further extension of technological experience in Greece.

Growing risks to property due to encreasing urban violence are creating yet another opportunity to expand related activities. Whole family of systems designed to supervise safety of property have recently reached the markets and their numbers and applications will grow to provide new outlets for hardware based on control technology.

5.6. Energy Management

Political consequences of dependancy on oil as the most widely used source of energy call for conservation on one hand and for development of alternatives on the other. Both aspects create opportunities for new products which could be used to serve further technological advancement of the Greek Industry.

Ammong the energy conservation products insulating building materials and efficient space heating systems will be prominent. Advances in plastic technology will play an important role in the development of suitable construction materials while engineering technology will be called upon to

design satisfactory heat management systems based on heat pumps, sun panels and other techniques. Both areas are probably within the technological capacity of the Greek industry even at its present level of technology but financial risks involved in the development of original products are preventing action. Risk-sharing assistance from an infrastructural authority could be all that is needed in this case. Suitable forms of assistance are proposed in Section 7. Rising of obligatory standards of insulation and heating in buildings and thus creating additional market for heat conservation products could be another way of stimulating action.

As for alternative energy sources initiative or sponsorship are needed by the Government or its agencies. Wind, ocean and sun energy convertors all seem to offer opportunities for long term investment and technological advancement as Greece is well endowed with all sources of natural energy and its territorial character calls for highly distributed generation of power. Experiments with design and employment of modern aerogenerators should be within the technological capability of the Greek industry and would seem very appropriate in a country with long tradition of windmills. Government should define its policy on this subject and assign well defined project to DEH or a specialised agency to lead development work and ensure that Greek industry benefits from new opportunities.

The projected experiments with the photovoltaic plant at the island of Crete and elsewhere by the National Energy Council will be worthwhile events from which Greece may get useful publicity but the Greek

industry is unlikely to benefit since the involved technology is far beyond its scope.

Work on bio-gas digesters and crop oriented power sources as long term projects would also seem appropriate in a country with agro-based economy. Processes for conversion of vegetable oils in diesel fuels should be of particular interest.

6. NEEDED MEASURES

In the previous sections we learned much about the shortcomings of the Greek industry and the reasons for its present state. To suit the discussion the weaknesses were described in conceptual terms. Remedial actions were implied but not defined. This will be done in the paragraphs of this section where specific measures will be proposed to effect the needed improvements.

Broadly the measures can be divided in two groups namely measures which lay within the functions of the Government and measures which need to be taken by individual industrial managements. The two groups will be discussed separately in the sub-sections which follow.

6.1. By the Government

Measures recommended here should provide practical means of encouraging and promoting technological innovation among Greek manufacturers and should help to create an atmosphere in which fears of the risks which innovations entail would be balanced out by the sense of inevitability of innovation as the means of survival in the competitive environment of EEC. The proposals concern institutional facilities through which the enterpreneurial risks could be minimised and administrative policies through which the implementation of the innovative process could be discretely directed.

6.1.1. Technological Development

Greek industrial infrastructure does not encourage technological progress. In this respect Greece will stand unique among EEC countries

where institutions sponsoring technological progress of their respective national industries are not only well established but enjoy priority attention of the governments.

To modernise industrial infrastructure Greek Government needs to set up an authority designed to assist individual enterprises with development of their technology bases through assistance with development, design and production of new proprietary products and through sharing financial risks involved in innovative ventures. The authority which will be further refered to as the Product Development Authority will be described in detail in Section 7.

Apart from the Authority representative body or bodies of professional engineering opinion should be created within the modernised infrastructure to advise the Government and to influence industrialists on matters concerning industrial policies. The proposed Authority could serve this purpose apart from its main function, and operations of technical universities should be reviewed and modernised to fill this need.

Greater concern for the quality of their products needs to be created among manufacturers. Drawing on practices established in other countries concept of 'Quality Label' should be adopted to force manufacturers to improve their technology through extra competitive pressures which the Label creates.

6.1.2. Climate for Progress

It was stated in Section 4 that technological innovation in industry

can take place only under conditions where innovative risks are balanced by confidence in steady business conditions. Such conditions do not exist in Greece at present. Frequent changes of industrial policies during recent years created atmosphere of uncertainly and the Government will have to reconsider the mechanism of its policy making to remmedy the situation. Future policy decisions should bear in mind the need for mutual trust between the Government and industry so that the industry in confident knowledge of Government safeguarding its interests can embrace the risks of technological expansion. In the future policies affecting the trading conditions of the industry should be formulated on a planning period basis and changes within these periods should be avoided. In such exceptional cases where avoidence could be impossible,changes should be discussed with the industry well ahead of their coming in force so as to allow the industry to take measures to protect its operating results.

Apart from the economic factors prestige often plays an important role in decisions affecting innovative progress and in many countries governments created prestigeous schemes to which industrial enterprises are admitted in recognition of their innovative achievements. The deserving enterprises are then allowed to use some distinguishing insignia on their products,on their stationery, some conspicuous flags on their buildings etc.

In some countries membership of such schemes entails practical advantages such as tax allowances and preferential access to borrowings.

Whatever the details of such schemes,the role they can play in creation

of climate conducive to innovation has been proved many times and the Greek Government should consider the idea. To suit Greek conditions concept of Advanced Technology Enterprises (ATE) could be created and the awards ceremoniously announced with full media publicity on important national days like the Independence or 'Ochi' Days. Yardstick for such awards would be the quality of original innovations to their products, production methods or management techniques. The **proposed Product Development Authority could devise the** rules and judge the merits of applications for awards.

6.1.3. Financial Measures

Policies controling availability of capital for industrial development need drastic revision in the light of higher technology requirements described in Section 4. Although the needs of some of the more significant ventures could be met in the future by the Product Development Authority under its risk-sharing schemes the bulk of industry will remain dependent on more conventional sources of financing for their technological penetration. For this purpose practices of ETVA and ETEVA must come under close scrutiny and ar e much modernised. Also operations of Stock Exchange should be developed to play a role by creating facilities for small investors to participate in technological development of the industry. For this purpose the US scheme of Small Business Investment Companies should be studied and venture capital societies floated with the Government assistance.

To insure steady growth and to remove the risks stemming from financial instability pointed out in Section 2 the unfavourable equity-to-debt

ratio prevailing in the Greek industry needs to be brought more in line with the practices of the EEC countries. All new industrial legislation should be formulated with this in mind.

Selective tax allowances should be considered as an additional device to encourage innovative investments. Specially favourable concessions could be given to innovative companies as means of directing industrial development towards the preferredtechnologies. Investments designed to improve productivity of labour should be particularly favourably rated for tax allowances to encourage modernisation of production. Profits derived from sales of products entirely engineered by manufacturers without any technology import could be exempted from taxes altogether for specified periods of time. At the same time losses incured by such products could be made eligible as claims against personal tax liabilities of enterpreneurs and shareholders to encourage greater willingness to take innovative risks. Product Development Authority could be the arbiter in granting the 'Innovative Company' status.

Finally re-structuring of borrowing facilities for trade is needed in order to terminate financial dependence of traders on manufacturers whose products they distribute in order to free manufacturers resources for investment in technological development and industrial growth rather than in finished products sitting on traders shelves.

6.1.4. Market Opportunities

The present practice by government departments and public corporations of awarding contracts on international basis to the lowest bidders should

be revised in favour of using public procurements to assist development of Greek technology. To this end all procuring authorities should set up small groups of engineers to study how Greek manufacturers could best benefit from technical requirements of their organisations. These groups should be independent of either the technical or the purchasing departments of the authorities concerned and should report directly to the executives concerned with procurement policies. Independently from activities of these groups technical and procurement departments should consider alternative ways of procurement such as placing of development contracts followed by closed bids for regular hardware contracts.

The Government should also study the possibility of using modernisation of administrative practices in its own departments and departments of public companies as a potential source of industrial development. For example the Government O & M (Organisation and Methods) specialists could study government accounting and administrative systems and similar systems of public companies with the view of up-dating existing practices through use of common units of hardware which then could be designed and made by Greek manufacturers. Many routine office practices such as filing, handling of correspondence and similar activities could be treated in this way to provide steady flow of stimuli of technological progress.

To alleviate the limitations of the home market Government should improve the competitiveness of the Greek exporters by establishing Export Guarantee Authority. By giving short term credits to foreign buyers the Authority would free exporters from the present disadvantage they

suffer when competing against manufacturers from countries where exporters enjoy such support. Apart from assuring the exporter of receiving early payment, transfer of his risks to the Authority would encourage greater number of enterpreneours to venture in foreign trading. The Authority could also exercise supervisory function by ensuring that only products of certain minimum quality are exported and that respectable image of Greek products is built abroad.

6.1.5. Training

Quality of technical education needs to be improved and its orientation more closely focused on practical needs of the industry. Facilities for up-dating and post-school training of industrial personnel should be increased in numbers and quality and greater number of people should be encouraged to attend. Courses, conferences and seminars on industry related subjects should be more numerous. International events on industrial and business management, on production engineering and on advanced technologies should be staged by Greek professional bodies and speakers of international reputation should be invited to attend.

6.1.6. Bureaucracy

Government approach to the administration of its industry should be reviewed. Bureaucratic concepts should give way to simple purposeful measures. Services of management consultants of international reputation should be obtained to make suitable proposals. Staffing of posts in direct contact with industry should receive particular attention and only people with business like aptitudes should be appointed.

6.2. By the Industry

Deficiencies of performance of Greek industry were already discussed in Sections 2 and 4. This sub-section will therefore only summarise what was already said and state explicitly what might have been implied.

6.2.1. Technology Base

So far Greek industry has been operating with minimum technological knowledge limiting its activities to reproduction of products designed elsewhere and trails therefore behind industries of the Community which Greece is about to join. Since ability to innovate ahead of competition is the only guarantee of long term survival and since innovation without sound technology base is not possible Greek industry has to improve its technology base. To this end future licensing aggreements should focus on transfer of technology rather than on transfer of a trade mark and agreements should be made only with licensors prepared to cooperate in this respect. But above all individual companies have to invest in D & D (Design and Development) facilities and employ properly qualified engineers able to create original technological know-how which will allow them to innovate on their own initiative in quick response to competitive pressures which they will encounter.

6.2.2. Quality of Management

In order to survive in the EEC environment efficiency of Greek manufacturers will have to become comparable with efficiencies of their EEC counterparts. Managements will have to learn to run their business on the basis of achieving annual objectives rather than in the laissez-faire manner which seems to prevail at present.

To achieve results of EEC standards all management functions will have to be performed with greater accuracy than so far and an overall control will need to be excercised to ensure that higher performance of all functions is maintained at all times. Senior managers will have to free themselves from day-by-day operations where their interest is mostly at present in order to exercise overall control. For this purpose greater delegation of responsibilities within management structures of enterprises will have to take place and appointments of mid-management executives will have to become an accepted practice.

Attention will have to be paid to improvement of all management functions discussed in Section 2. However productivity of labour and financial resources must be of prime concern. Better direction of labour and provision of more efficient tools will become increasingly important as the rate of rising labour costs accelerates under EEC membership. Financial resources will need to concentrate on narrower ranges of products and deeper penetration of markets as the force of competition increases.

Traditionally passive selling practices will have to be abandoned in favour of modern concepts of agressive marketing to create new markets and to increase shares in existing ones. New concepts of quality of products and reliability of deliveries will be also needed to accompany systematic development of markets.

Last but not least the financial strength of companies will need to

be much altered and far greater share of equity invested so that trading surpluses become available for re-investment and sustained growth rather than be paid to the banks to service heavy borrowings as at present.

7. PRODUCT DEVELOPMENT AUTHORITY

Analysis of performance of the Greek industry and of its future prospects carried out in the previous sections pointed towards lack of indigenous technology as one of the main obstructions of satisfactory future development. It was observed that to remedy the situation corrective actions will be needed by the industry but that at the same time the character of these actions and the present state of industry will require the Government to take parallel action by offering suitable assistance to make technological innovation more attractive to the industry. To this end it was felt that the Government should adopt an approach well established in many industrialised countries of combining technical and financial aid into a development package designed to assist with overcoming technical problems encountered in development of new products while at the same time helping to ease the related financial risks. It was suggested therefore that the Government should launch new infrastructural body which could be appropriately named Product Development Authority. In this section we shall describe the manner in which the Authority should apply itself to the task.

7.1 Principals of Operation

Terms of reference of the Product Development Authority (PDA) should be to promote development of tehnological knowledge at the level of industrial enterprises. As this can be effectively done only through design, development and production of marketable products PDA would function through giving assistance to individual manufacturers endeavouring to innovate their products, their means of production and their marketing practices.

Because of the inherent dependence of the Greek industry on imported technology this assistance should be available not only in cases of original development but also where original improvements to products based on foreign technology were concerned. It also should be available to established manufacturers as well as those starting new business. Essential condition would be presence of an element of innovation making tangible contribution to the technological and business knowledge of the manufacturer.

To serve its purpose PDA would possess engineering development facilities to assist with technical work of its clients and have access to capital resources for its risk sharing function. Cooperation with clients would be either on the basis of their requests or at PDA's initiative in persuit of long term policies aimed at directing Greek industrial development in particular direction.

PDA's technical assistance would be available at all stages of product development from its conceptual design to finalisation of production drawings, specifications and methods of manufacture.

Cooperation between the Authority and the manufacturers would be through the work of design teams composed of engineers of both parties working at the premises of the manufacturers and backed by the facilities of the Authority. In cases where client's product development facilities were inadequate work would start at the premises of the Authority but would be transfered to the manufacturer's plant as soon as his facilities were brought to the required standard. Establishment or up-dating of his development facilities would be one of the conditions of contract between manufacturers and the Authority.

Because of its government status the Authority would be in the position to request assistance from UNIDO or other inter-government institutions to strengthen in particular circumstances joint teams by services of international experts. It also could request UNIDO or other organisations for assistance with provision of equipment and with start-up of its laboratories and workshops.

PDA's assistance would not need to cover all stages of the development process of a product and could apply only to certain stages when so requested by the client.

To ease financial risks of innovation PDA would take financial stake in the assisted ventures. This could take many forms as shown by ample examples of practices of industrial development authorities in other countries which could be copied by PDA.

The simplest approach to sharing financial risks of innovation is through joint ventures where the authority and the manufacturer share costs of a project on 50:50 basis until it becomes viable. Then the authority sells its holding in the new product to the partner. If the project is a failure the manufacturer loses only half of the costs. If the project succeeds the authority recovers the costs plus market value of its holding. Another way is for the authority to buy the project in its early stage from the manufacturer i.e., to provide the development capital and to lease it back to him for development and exploitation. When the product reaches the market the manufacturer sells it as sole licensee and pays royalties to the authority. He also may purchase it back any time he wishes. Recirculating loans

are another well known method usually used to finance production and marketing of unproven products. According to this concept no interest is charged until the product shows viability and then the capital is retained by the borrower to finance the following volumes of products. Related to the concept of re-circulating loan is the practice of financing manufacture of pre-production models of expensive complex items by the development authority. If the equipment succeeds the manufacturer re-pays the capital. If it fails he owes nothing to the authority.

Part of the risk of innovation is the cost of development of markets for new products and therefore PDA should also provide on a consultation basis information on markets and/**give/**assistance with their development. Cooperation with the Hellenic Export Promotion Organisation in systematic promotion of new industrial products based on proprietory Greek technology should therefore also be one of PDA's functions. Because of the innevitable dependence of Greek industry on imported technology PDA should also be in the position to advise clients on foreign manufacturers interested in licencing agreements.

All PDA activities should be coordinated within the framework of long term policy of strengthening idigenous technology base in Greece. Practical steps towards the goal would be periodically re-defined in the light of technological and market conditions. For that purpose PDA would need to possess good data base obtained by constant monitoring and by periodic surveys of world technology and the related markets.

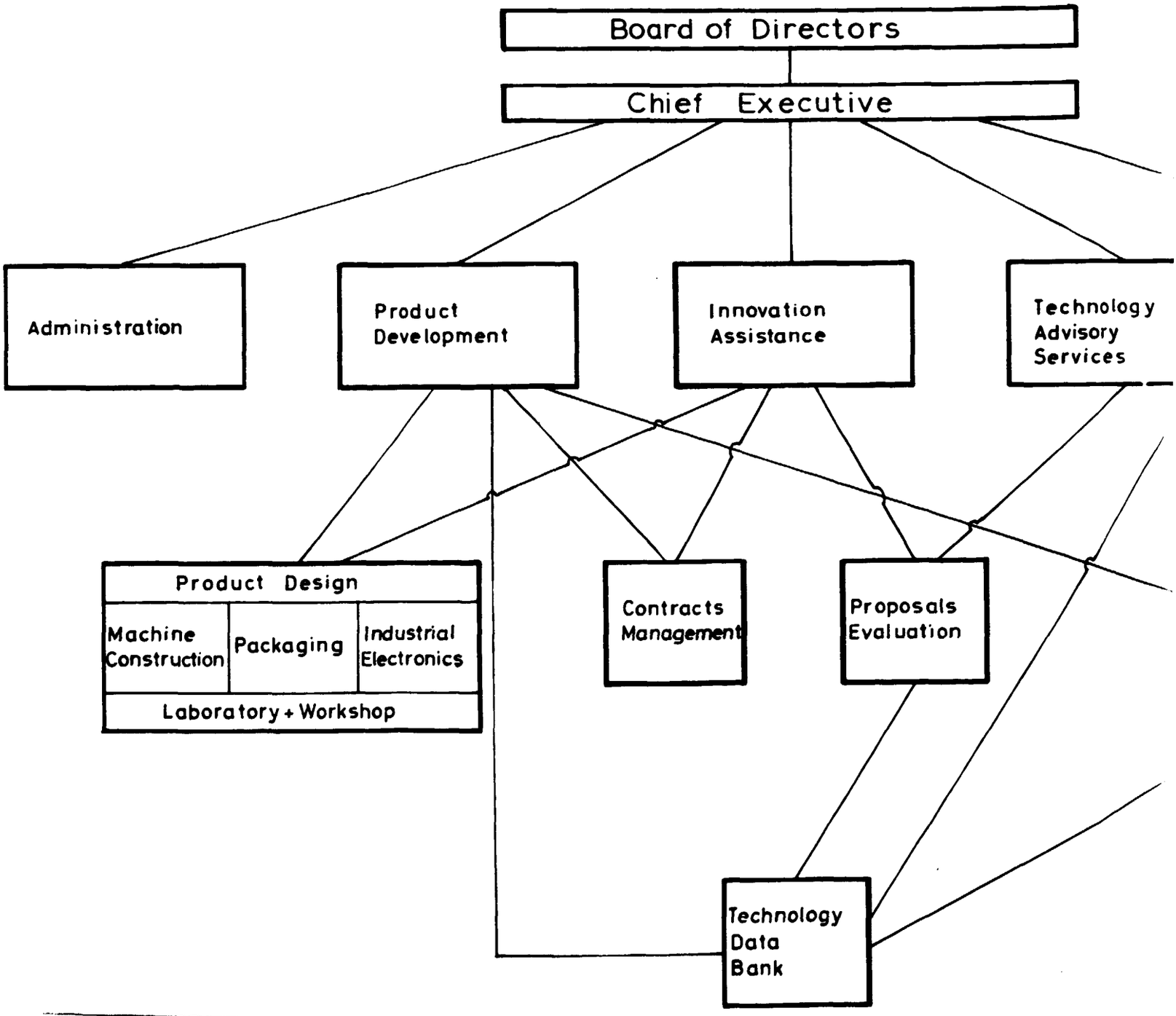
PDA could also be assigned some secondary functions and be instrumental to implementation of few other suggestions made in the course of this study. It could for example manage equipment development contracts for the Government and public authorities, should public procurements be better utilised for advancement of the Greek industry in future. Also should the idea of Advanced Technology Enterprise (ATE) awards be taken up PDA could be the arbiter in granting the awards. Similarly PDA would be qualified to determine on behalf of tax authorities the Innovative Company status suggested in Section 6. Finally PDA could also perform the role of focal point of advanced technology mentioned in Section 4.

7.2. Organization

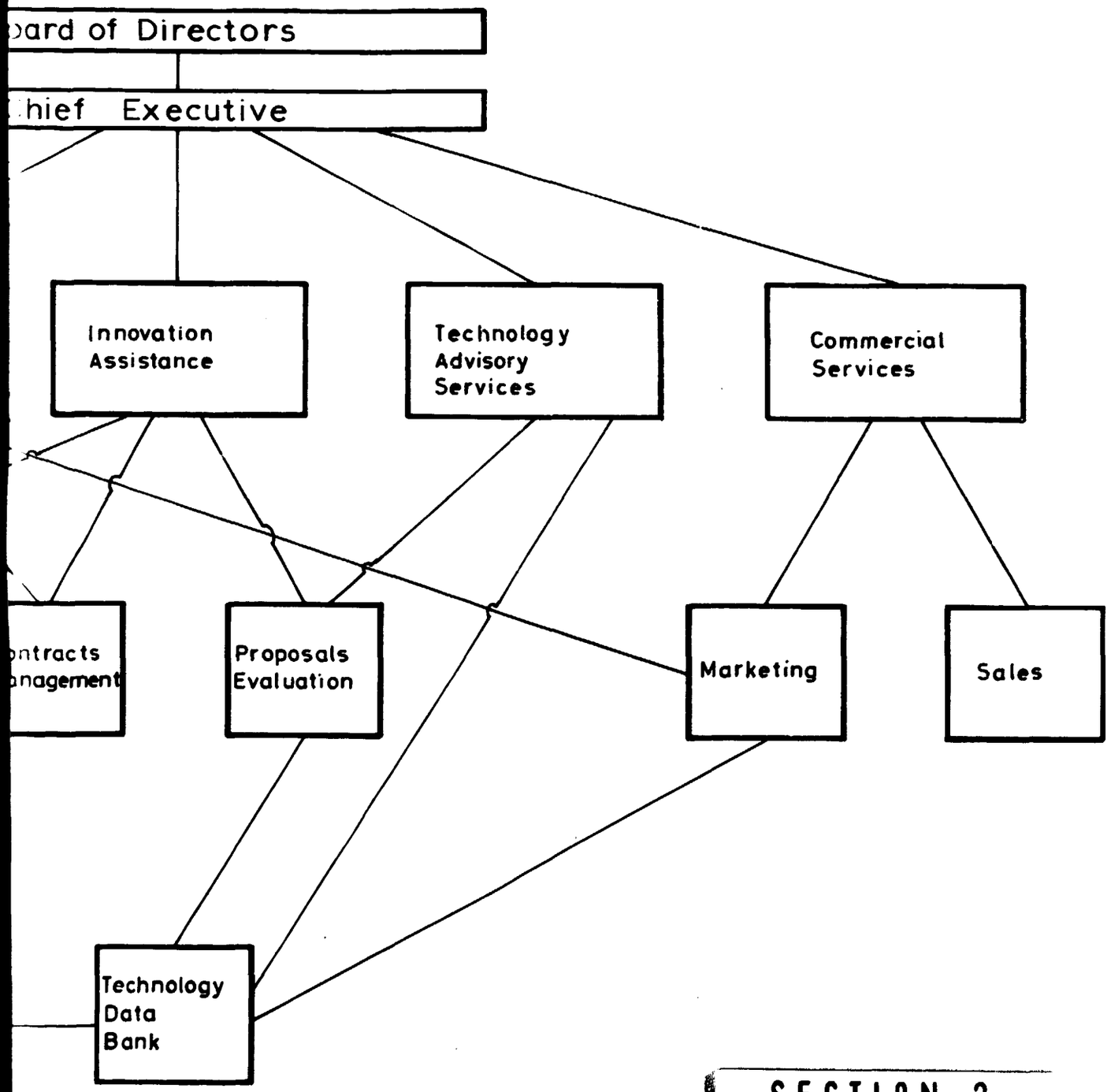
To give the reader clearer appreciation of the way PDA is intended to function tentative organisation chart is shown in Fig. 7.1. The diagram shows that the Authority would consist of five functional departments (four production departments plus administrative office) and six service units most of them serving several departments. Heads of the departments would be responsible to the Chief Executive who in turn would be responsible to the Board of Directors.

Of the four production departments/Product Development (PD) and Innovation Assistance (IA) would constitute the core of PDA's activities. PD would be the centre of technical assistance and IA would perform the risk sharing function. PD would function through its Product Design facility consisting of a team of qualified development/design engineers, engineering laboratories

Fig. 7.1: PRODUCT DEVELOPMENT AUTHORITY



CT DEVELOPMENT AUTHORITY



and workshops. Proposals Evaluation unit would be at the centre of operations of IA department. Its Contracts Management unit would monitor progress of all assistance contracts of the Authority.

Initially PDA would concentrate its technical assistance on the balancing industries only but would extend it to all sectors identified in Section 3 in due course. Risk sharing assistance would be available to all sectors right from the start however. It would not need to be coupled with technical cooperation.

The remaining two production departments would function on consultacy basis. Technology Advisory Services would advise manufacturers on availability and character of sources of technology abroad and would assist appropriate government departments with administration of ATE and Innovative Company schemes. It would be also responsible for programmes related to PDA's role as focal point of advanced technology. Commercial Services department would supply marketing and sales information upon requests from manufacturers. Services of these departments would be available against payments of fees. Information held by the two departments would of course be also available for policy planning and other operational decisions of PDA.

An important source of background information will be the Technology Data Bank which PDA should establish as a matter of priority to overcome the serious lack of technological information in the country. It was hoped that the basis of the Bank could be established within this project but the task proved too big to be accomplished within the time and resources available. Suitable methodology was however developed and could

be used by the Authority. Details will be found in Appendix F.

The last of the functional departments would administer PDA's financial matters, its personnel and legal aspects of its operations. Publicity and public relations should also be one of the functions of this department. Publicity in fact would be the major administrative activity in the early days of PDA's operations.

The Chief Executive will be responsible for establishment of programmes of projects within the policies defined by the Board and in accordance with conditions prevailing in the industry and the markets. His second major responsibility will be to sell PDA's services to potential clients and to obtain resources for PDA's risk sharing function.

The Board of Directors should be small, say seven members. Three members could be appointed ex-officio to represent the interests of the Government and further three members could be appointed from the industrial community on personal merits. The seventh member should be the Chief Executive. The Board would meet only twice or three times a year to review progress. Once a year the Board would review the targets, operational results and financial position presented by the Chief Executive It would re-define policies when necessary. For reasons of efficiency the Chief Executive would have full executive responsibility alone.

Ideally the Authority should be established as a public company and it should operate on profit basis. The profit motive should ensure that the Authority operates efficiently. The results would directly

contribute towards expansion of its activities. If this concept was not acceptable within the framework of Greek public administration then the logical place for PDA would be as one of the satellite organisations of the Ministry of Industry.

7.3. Programme of Work

In the earlier sections we established that the function of PDA should be to assit manufacturers to develop their own technology base and that this should be done through assistance and/or sponsorship of design and manufacture of innovative products. We also concluded that initially PDA should give greater priority to projects concerning the balancing sectors but that other sectors depending on the same technologies should not be entirely ignored. Then in Section 5 we proposed number of programmes which PDA could follow in particular sectors. However it was not possible to establish the priorities of our proposals as these would depend on a number of factors outside the scope of this study. It was left therefore to PDA itself to analyse these factors at the beginning of its operations and to define its own programme of work on the basis of our proposals and results of its own ivestigations.

Since staff requirement reflect the character of work performed Table 7.1. was prepared to describe the way PDA's operations could be expected to develop.

As preparation of the work programme will be the first task of the Authority, Product Development, Commercial Services and the Data Bank will have to be staffed early to assemble information needed by the management

Table 7.1.: Staff of Product Development Authority

	1st Year	2nd Year	3rd Year
Managing Director	1	1	1
secretary	1	1	1
Product Development			
chief	1	1	1
engineers	3	6	6
technicians		6	6
secretaries	1	1	X
Innovation Assistance			
chief	1	1	1
evaluation engineers		2	2
evaluation assistants		1	2
contract engineers		1	1
contract assistants			X
secretaries	1	2	2
Technology Advisory Services			
chief		1	1
data bank officers	1	1	1
data bank assistants	3	3	6
secretaries	1	1	1
Commercial Services			
chief	1	1	1
marketing officers	3	3	X
marketing assistants	X	X	X
sales officer			1
sales assistants			X
secretaries	1	2	2
Administration			
accountant		1	1
legal officer		1	1
personnel officer	1	1	1
public relations officer	1	1	1
secretaries	1	2	2

X - indicates staffing but of unpredictable numbers

to make the programme decisions. Presence of a senior officer in the Innovation Assistance department will also be needed early to prepare estimates of the size of funds PDA will need for its risk sharing investments and to assist the Managing Director with the related negotiations. In the Administration department Public Relations officer will be required early in the project to make the availability of PDA's services and their character widely known.

To estimate the size of PDA's operations in the second and subsequent years is more difficult since much will depend on the shape of the work programme agreed during the first year. However activities of the Product Development department can be expected to double in the second year since the development laboratories and the workshops should become operational. With the technical facility established, applications for assistance should start coming in during this year and therefore Innovation Assistance department should become fully staffed. With the Data Bank well advanced by then Technology Advisory Services and Commercial Services should become available to the clients. Increased support from Administration will also be needed in the second year.

Assuming that PDA's policies and programme of work will be ready in the first year question of its risk capital will have to be settled early in the second year to allow the risk sharing operations to start. The funds could be obtained from national budget either as a grant or on the basis of agreed borrowing capacity. Initial sum between Drs (1980) 100 and 200 million will probably be needed.

As for further growth in the third year it can only be assumed that the growth would be mainly in the Product Development and Innovation Assistance departments since they will be the main pillars on which the whole concept of PDA will rest.

Estimate of operational costs based on the foregoing description will be found in Appendix G.

7.4. Hellenic Technology Centre

Hellenic Technology Centre (HTC) was established by decree of the chairman of Scientific and Research Agency of the Ministry of Coordination in January 1980 for the purpose of promoting product design capacity of the Greek industry. Its aim is therefore identical with the purpose of the proposed Product Development Authority and could fill its role. However before this could happen the concepts of HTC's operations would need to be modified in at least five important points.

The first point which would require reconsideration concerns the choice of industrial sectors through which assistance should be channelled. While there is identity of views between PDA and HTC concepts that precision engineering and electronics are key technologies needed for future progress of Greek industry the plan proposed by the Centre to strengthen them through encouragement of aeronautical engineering and through design of sophisticated electronic hardware such as flight simulators ignores both the immediate needs of the Greek industry and the limitations of its capability to absorb new technology. The concept was obviously conceived with the eye on long term high technology achievements but

the stated approach fails to recognise the need for Greek industry to be able to walk before being able to run. Such overambitious programme would inevitably lead to disappointments and waste. On the other hand the PDA concept which proposes to approach the problem through encouragement of balancing industries and manufacture of products of intermediate technology is aiming at teaching the industry to walk while leaving the question of running to be dealt with in the future when the walking stage was accomplished. Moreover apart from precision engineering and electronics PDA approach also provides for strengthening of plastic technology which was shown by this study to be also essential for future industrial growth. The HTC does not include plastics sector in its programme.

Absence of financial involvement in projects of its clients to share their risks of innovation is second point where the concept of the Centre falls short of practical needs of Greek industry. Experience of industrial development authorities in other countries shows that the risk sharing facility is often more important than help with technical problems. In fact in some industrialised countries risk sharing is the only form of assistance offered. If its availability is important in the industrialised countries it is even more important in Greece where manufacturers have still to learn the importance of investment in technology let alone in innovative technology. In the PDA concept risk sharing assistance is therefore seen an equally important function as the technical assistance itself and HTC's structure would have to incorporate this facility if it was to fill PDA's role.

Delivery of assistance provided by the Centre is planned through designing products at its facilities for production by manufacturers at their plants. This is likely to be counterproductive since it will lead to designs expensive to make and to early loss of reputation of the Centre. The nature of modern design work and the narrow margins between profitable and unprofitable production methods requires that cost effective product can be designed only if the designer/design team works in the plant concerned. For this reason PDA concept of delivery of its assistance is based on making the manufacturers receiving assistance first to establish or up-date their own development facilities where the joint teams will then carry out the design work in close proximity of the production facility for which the product is to be designed. PDA's own technical facilities are intended to provide only back-up service.

Also the overcentralised concept of administrative structure of the Centre as outlined in the promulgating decree would need reconsidering before HTC could fill the function of the Authority. Because of the wide range of expertise needed for successful delivery of assistance of the kind described in this report, organisation charged with the task must operate on the basis of delegated responsibility and decentralised decision making to ensure operational flexibility and to attract staff of adequate calibre. Management concept of the Centre as described in the decree carries traditional stamps of Greek government bureaucracy and would need to be considerably changed before the functions of the Centre and the Authority could merge.

Finally the proposed location of the Centre in remote rural setting with no easy access from industrial areas is going to detract from its effectiveness. If industrial development facility is really intended to be of practical benefit to the industry it must be located within easy reach of enterprises. Since almost 50% of the Greek industry is in the Athens-Piraeus urban area the new facility must also be located there. If however interests of presonnel working at the facility are put before the interests of the industry then remote rural setting as proposed for the Centre is of course attractive.

8. CONCLUSIONS AND RECOMMENDATIONS

8.1. In its present state Greek industry is very vulnerable. Competition from foreign manufacturers under full EEC memberships will put some 40% of Greek industrial output at serious risk of going out of business. Only a little over 30% can be regarded as reasonably safe.

8.2. Four factors are the main cause of weakness, namely lack of indigenous technology, imbalance of industrial structure, low level of equity in business and outdated management concepts. To achieve improvement change **of attitudes in industry and innovation of industrial structure are needed.**

8.3. For development of indigenous technology, industry will have to use imported technology more creatively in the future than hitherto. Future licencing agreements should be negotiated on basis of technical cooperation rather than simple transfers of manufacturing information. Imported technology will remain an important source of know-how, however.

8.4. To correct the imbalance of industrial structure, sectors dependend on skills in precision engineering and in plastic and electronic technologies need to be encouraged on a priority basis. Machine construction, packaging industry and industrial controls are recommended for accelerated development to meet that purpose.

8.5. Financial structure of enterprises will have to change in favour of greater equity participation in business to create adequate financial base needed to cope with greater capital requirements of technologically more sophisticated products.

8.6. New management techniques together with more dynamic approach to business are needed to increase productivity of resources and to generate adequate income for re-investment in design and production of technologically more advanced products.

8.7. Current outlook of financial institutions and their conditions for industrial loans set an effective barrier to technological advancement of industry. New criteria for granting loans to technology oriented industries are needed. Assistance available through ETVA and ETEVA is not effective for this purpose.

8.8. Infrastructural facilities are inadequate. In particular, facilities for sharing financial risks of innovation found in all industrialised countries are missing in Greece altogether. Nor does the infrastructure offer any form of technical assistance to innovative entrepreneurs. New authority is therefore needed to fill the gap.

8.9. Recently promulgated "Hellenic Technology Centre" could become the new infrastructural facility providing that its terms of reference are modified and enlarged. Failing that, Product Development Authority proposed in this report should be established.

8.10. Apart from establishing new infrastructural authority, the Government should use public procurements to stimulate development of original technology in Greece to a greater extent than in the past. The Government should also use various prestigeous schemes to promote penetration of technology and improvement of quality of Greek industrial products. The Government must also endeavour to create atmosphereof greater industrial confidence. Without such confidence innovation is not possible.

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Table A.1.: Sectoral Ratios

			FOOD		BEVERAGES		TEXTILES		PLASTIC		CHEMICALS		BASIC METALS		METAL PRODUCT
			GR	UK	GR	UK	GR	UK	GR	UK	GR	UK	GR	UK	GR
Structure of capital (% of TA)	FA	%	32	50	40	73	39	41	35	55	41	48	39	39	25
	ST	%	34	17	28	20	20	37	22	16	21	19	33	21	
	LA	%	32	30	30	15	36	27	40	28	33	32	22	39	39
	NW	%	23	55	31	62	30	69	32	60	39	54	39	62	32
	D	%	17	4	15	20	24	4	22	10	17	9	25	6	9
	CL	%	60	27	53	21	45	28	50	38	43	35	35	29	59
Credit control	CA/CL	times	1,16	1,75	1,08	1,80	1,32	2,61	1,30	1,66	1,24	1,68	1,58	2,15	1,22
	LA/CL	times	0,58	1,00	0,56	0,77	0,82	1,15	0,85	1,12	0,76	1,07	0,64	1,40	0,66
	ST/NCA	times	3,40	0,75	6,44	1,20	1,47	1,06	1,50	0,79	1,94	0,95	2,61	0,70	2,69
	CL/NW	%	219	55	172	30	148	47	154	67	111	67	88	47	186
Financial performance	P/CE	%	2,5	15,6	1,7	15,0	1,40	11,6	4,0	13,6	0,75	12,4	5,3	8,6	4,4
	P/S	%	2,3	7,0	2,0	15,5	2,73	6,6	5,0	11,8	0,94	8,9	6,2	6,1	5,6
	S/CE	times	1,1	2,2	0,85	0,95	0,52	1,62	0,75	1,30	0,80	1,40	0,85	1,45	0,83
Technical performance	S/FA	times	3,2	3,4	2,14	1,35	1,34	3,67	2,1	1,7	1,92	2,4	2,13	3,0	3,29
	S/NCA	times	10,8	n.a.	19,6	7,5	3,80	4,68	5,3	5,3	7,39	3,5	6,52	3,9	6,73
	S/ST	times	3,1	10,8	3,08	9,5	2,51	6,00	3,5	6,0	3,79	5,8	2,59	5,7	2,55
Labour management	W/S	%	8,7	17	7,2	9,8	19,1	29,5	15,0	31,0	10,5	17,5	10,2	27,0	13,0
	TA/W	times	12,2	4,6	16,1	14,0	10,0	3,21	8,7	3,96	11,8	6,3	12,7	3,45	9,4

APPENDIX A

PLASTIC		CHEMICALS		BASIC METALS		METAL PRODUCTS		MACHINERY		ELECTRICAL EQUIPMENT		MOTOR INDUSTRY	
GR	UK	GR	UK	GR	UK	GR	UK	GR	UK	GR	UK	GR	UK
35	55	41	48	39	39	25	40	20	32	30	33	41	37
22	16	21	19	33	21	21	31	31	33	24	31	16	34
40	28	33	32	22	39	39	33	47	36	38	34	46	32
32	60	39	54	39	62	32	60	30	59	33	60	24	41
22	10	17	9	25	6	9	12	15	8	17	8	52	5
50	38	43	35	35	29	59	32	56	33	49	32	23	34
1,30	1,66	1,24	1,68	1,58	2,15	1,22	2,10	1,38	2,25	1,30	2,30	2,42	1,96
0,85	1,12	0,76	1,07	0,64	1,40	0,66	1,00	0,84	1,07	0,77	1,15	1,73	1,04
1,50	0,79	1,94	0,95	2,61	0,70	2,60	1,00	1,44	0,86	1,76	0,95	0,48	1,20
154	67	111	67	88	47	186	50	183	60	150	59	96	68
4,0	13,6	0,75	12,4	5,3	8,6	4,4	15,0	0,7	15,0	loss	15,0	0,14	16,1
,0	11,8	0,94	8,9	6,2	6,1	5,6	11,5	1,26	8,8	loss	9,0	0,41	8,4
,75	1,30	0,80	1,40	0,85	1,45	0,83	1,30	0,56	1,70	0,62	1,65	0,37	1,90
2,1	1,7	1,92	-	2,13	3,0	3,29	2,6	2,78	4,3	2,04	3,5	0,93	4,0
5,3	5,3	7,39	3,5	6,52	3,9	6,73	3,7	2,71	3,4	4,40	3,6	1,28	5,3
,5	5,0	3,79	5,8	2,59	5,7	2,55	3,9	1,83	3,9	2,44	3,8	2,40	3,6
5,0	31,0	10,5	17,5	10,2	27,0	13,0	35,0	12,9	29,5	15,0	32,0	26,2	30,0
3,7	3,96	11,8	6,3	12,7	3,45	9,4	3,6	14,3	3,45	10,7	3,60	10,4	3,15

TA - Total Assets
FA - Fixed Assets
ST - Stocks
LA - Liquid Assets
NW - Net Worth
D - Long Term Liabilities
CL - Current Labilities

CA - Current Assets (LA plus ST)

NCA- Net Current Assets(CAminusCL)

CE - Capital Employed
P - Profits
S - Sales

W - Wages and salaries

SECTION 2

APPENDIX B

Management Functions in Terms of Business Ratios

Quality of plant $= \dfrac{(FA/TA)_{gr}}{(FA/TA)_{uk}}$

Production methods $= \dfrac{(LA/TA)_{gr}}{(LA/TA)_{uk}}$

Utilisation of plant $= \dfrac{(S/FA)_{gr}}{(S/FA)_{uk}}$

Financial strength $= \dfrac{NW_{gr}}{NW_{uk}}$

Financial stability $= \left(\dfrac{NW}{D+CL}\right)_{gr} : \left(\dfrac{NW}{D+CL}\right)_{uk}$

Sales performance $= \dfrac{(S/ST)_{gr}}{(S/ST)_{uk}}$

Labour productivity $= \dfrac{(W/S)_{uk}}{(W/S)_{gr}} \times \dfrac{W_{gr}}{W_{uk}}$

Production management $= \dfrac{(TA/W)_{gr}}{(TA/W)_{uk}} \times \dfrac{W_{gr}}{W_{uk}}$

Profitability $= \dfrac{(P/S)_{gr}}{(P/S)_{uk}}$

Productivity of capital $= \dfrac{(S/CE)_{gr}}{(S/CE)_{uk}}$

APPENDIX C

C. PERFORMANCE OF SELECTED SECTORS

C.1. General

Table C.1. was produced to study the quality of industrial management in Greece. As the data relate also to the performance of the industry itself the table provided also useful information for wider considerations of the report. Although useful the information remains however outside the main stream of the argument and does not fit in the structure of the report. As however it was felt that because of its general character the information would be of interest to some readers it was therefore included in the document in the form of this appendix. The discussion of the sectors is arranged in the order of their rating derived on the basis of the tabulated parameters.

Starting with the most efficient sector, Basic Metals, the technically oriented parameters give a picture of a well equipped and well run industry. Low rating of financial stability stands therefore in a sharp contrast with high values of other parameters which indicate professional management of good quality. The situation suggests therefore problems of financial structure of Greek economy rather than lack of prudence on the part of management are the likely cause of this weakness as indeed seems confirmed by the low ratings of this parameter throughout the sectors. The exceptionally high rating of production methods seems to reflect the modernity of Greek plants in comparison with the plants in Britain where metallurgical industry has a longer tradition and correspondingly older plants.

Table C.1. Performance of Selected Sectors

Code	Sector	(1) Quality of plant	(2) Production methods	(3) Utilisation of plant	(4) Financial strength	(5) Financial stability	(6) Sales performance	(7) Labour productivity	(8) Profitability	(9) Productivity of capital	(10) Rating
20	Food processing	0,79	0,93	0,94	0,47	0,19	0,32	0,49	0,33	0,50	5
21	Beverages	0,55	0,30	1,52	0,46	0,28	0,31	0,37	0,13	0,89	6
23	Textiles	0,95	0,94	0,36	0,43	0,20	0,42	0,47	0,41	0,32	9
30	Plastics	0,64	0,60	1,23	0,53	0,35	0,52	0,57	0,42	0,57	3
31	**Chemicals**	0,85	0,37	0,79	0,72	0,65	0,66	0,33	0,11	0,57	4
34	Basic metals	1,00	1,22	0,71	0,63	0,37	0,46	0,90	1,00	0,58	1
35	Metal products	0,58	0,65	1,27	0,50	0,34	0,67	0,67	0,49	0,64	2
36	Machinery	0,62	0,95	0,65	0,50	0,30	0,46	0,54	0,14	0,33	10
37	Electrical equipment	0,81	0,83	0,58	0,56	0,33	0,61	0,60	loss	0,37	8
38	Motor industry	1,12	0,80	0,23	0,68	0,38	0,67	0,29	0,46	0,19	7
	Greek averages	0,79	0,76	0,63	0,55	0,34	0,52	0,51	0,28	0,50	
	British reference	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	

* Includes shipbuildings

The conspicuously high utilisation of plant in the case of Metal Products which ranks second, needs to be considered together with low ratings of plant quality and quality of methods of production. The combination suggests that the sector is concerned mainly with production of low technology products made in large quantities. Business appears however well managed as indicated by above average productivity of both labour and capital, good salesmanship and second highest profits in the sample.

The Plastics sector seems similar to metal products in so far that it appears to consist of plants equipped for low technology products but well run to produce good profits and at Greek standards, good return on capital. Both labour productivity and salesmanship are above average. Financial strength and stability are however low.

Rating of Chemicals at only 4% above the Greek average seems unexpectedly low as heavy industry is usually expected to perform above national norm in countries with only short industrial history. However, explanation can probably be found in composition of this sector. Heavy chemicals account in Greece for only some 40% of its size, the rest being a broad spectrum of small and underequipped light industries of indifferent efficiency, including a substantial percentage of firms concerned with only packaging of imported products. Presence of these labour intensive operations may explain low ratings of productivity of labour and methods of production and intensive sales performance. It would seem to account also for low rating of the quality of plant which for heavy chemicals should be substantially higher than indicated

by the table. There does not seem to be a satisfactory explanation of the low rating of profitability of the sector.

Food Processing appears to be financially most unstable sector and therefor most vulnerable from competitive pressures. With plants equipped for lower quality products and weak salesmanship, the sector seems to be poorly placed to take advantage of new markets which should become available to it through Greek membership of the EEC. However, reasonably good utilisation of plant indicates an adequate home market which should give it a base from which to embark on modernisation of plant and improvements of products.

Beverages show a strange mixture of lowest and highest ratings in the sample. The picture is probably seriously distorted by exceptionally high level of automation of the British beverage industry on one hand and the significance on wine production in Greece which has no parallel in Britain on the other.

Superficially situation of motor industry appears good. The table shows its financial strength best in the sample, financial stability above average and plants well equipped. On closer examination however, it is seen that the financial strength is based on exceptionally high long term borrowings and that Greek and British plant parameters are not comparable since Greek data include ship building while British information covers motor industry only. In fact production seems to be poorly run as indicated by very low productivity of labour and utilisation of plants. Firms are in fact the worst in the sample. High

rating of sales performance and profitability could indicate good business management but in view of the poor performance on production side, business success is probably due to the sellers nature of the Greek market and high prices of vehicles in Greece. High debt together with the very low productivity of capital and relatively high profitability suggest that factors other than industrial production distort the picture of financial performance. The cause was found in financial involvement of manufacturers in retailing of their products which is necessary because of absence of customer credit facilities in Greece.

Electrical sector is shown in the table as returning negative profit. The reason seems the high percentage of consumer goods in the output of the sector and the consequent heavy involvement of manufacturers in retail trade. Unlike in the case of motor industry, bank borrowings are not available on the same scale and hence greater pressure on cash flow and financial performance. On the technical side the sector is third best equipped in the country and seems to be well run. Both labour productivity and salesmanship are above the Greek average. Low loading of plants is probably result of in-built overcapacity rather than due to inept management.

The largest of the Greek industrial sectors, textiles, comes surprisingly low in the classification table. This is inspite of its well equipped plants and good level of technology. Its overall performance is severely degraded by the financial parameters among which the stability and the productivity of investment are almost the worst in the sample. This

weakness will cause serious problems to many companies when textile imports from developing countries reach the Greek market under the conditions of EEC membership. Better salesmanship and improved productivity of labour will be required if the sector is to achieve a competitive position in the EEC environment. Although the involvement of manufacturers in retail trade no doubt contributes to low financial performance, excessive vertical structuring of the mills probably plays the main role however.

Plants in the Machinery sector appear rather ill equipped but skillfully even though not intensively used. The reason is probably the pattern of production dominated by manufacture of single items rather than problems of technical management which seems of an average quality in the Greek circumstances. On the business side management appears weak however. Profitability and productivity of capital are very poor and salesmanship appears inadequate.

APPENDIX D

D. VULNERABILITY OF SECTORS

It was argued in the main text of the report that the combined effect of **the lack of management adaptability and original technology will force a** significant percentage of Greek companies out of business under EEC conditions. To obtain some measure of magnitude of this risk Table 2.3 was constructed to show to what extend individual sectors may be affected. **to construct the table, effects of both factors were first estimated separately and the plots were made on an arbitrary but identical scale. The graphs in Table 2.3. were then obtained by geometric addition.**

of the two sets of plots.

Several assumptions were made at the outset. First it was assumed that lack **management** adaptability in face of new competition will be the main cause of mana- can be broadly related to the size of a company **since** the problem would be most severe **for** the well established middle size companies where traditionally management is a family affair. Both larger and smaller companies were **thought** to be more flexible because larger companies are likely to be run by trained professionals and smaller companies are run by individuals often well informed and trained.

It was **also thought** that the middle **size company would** be more exposed to the effect of competitive presures than either smaller or larger companies because their markets are of the size likely to be of interest to foreign manufacturers and their resources are generally inadequate to initiate rapid innovative countermeasures. Markets of the smaller companies were thought to be less vulnerable because of their local character and **because the larger manufacturers were thought to possess means of effective defence.**

On the basis of these assumptions medium size manufacturers were taken to be the high risk sector. Of the remaining two groups the larger manufacturers were considered to be at low risk and the risk of smaller manufacturers was considered to be somewhere between low and high.

The boundaries between the three groups were set at 10 to 50 employees for small, 50 to 250 employees for medium and over 250 employees for large manufacturers. Companies employing less than 10 persons were considered irrelevant for the purpose of the study.

As for the technology related vulnerability it was assumed that companies with some technical connections abroad will be in a stronger position than those without it and therefore they were considered as low risk and high risk sectors respectively.

Almost 1500 companies published in the ICAP Directory of Greek Companies were analysed by these criteria and the results were summarised in Tables D.1. and D.2.

APPENDIX E

E. ADVANCED TECHNOLOGIES - WORLD VIEW

The mechanism of technological advancement is an interplay between a pull of market forces and a push of scientific work. Most of the new discoveries are made because changed life conditions create a market pull for new products which cannot be satisfied by the existing technologies. Then once a discovery is made scientific inertia carries the process further bringing about refinements which push additional products on the market where competitive forces create a further pull on technology. Closed loop of technology advancement is thus set.

The state of modern industry is the result of a continuous flow of such discoveries some of which have had a more profound impact than others. Steam and combustion engines, electricity, invention of the thermionic valve and more recently the electronic solid state device can be seen as threahhold discoveries which changed the face of industry at the time and set it on new course. Of these threasholds solid state technology seems to be the most farreaching element changing the character of virtually all branches of industry and itself undergoing continuous and dramatic changes all the time. In its latest form, the microelectronic chip, man has the most powerful industrial tool ever created. Obviously therefore microelectronics must be the main consideration when analysing world technology trends.

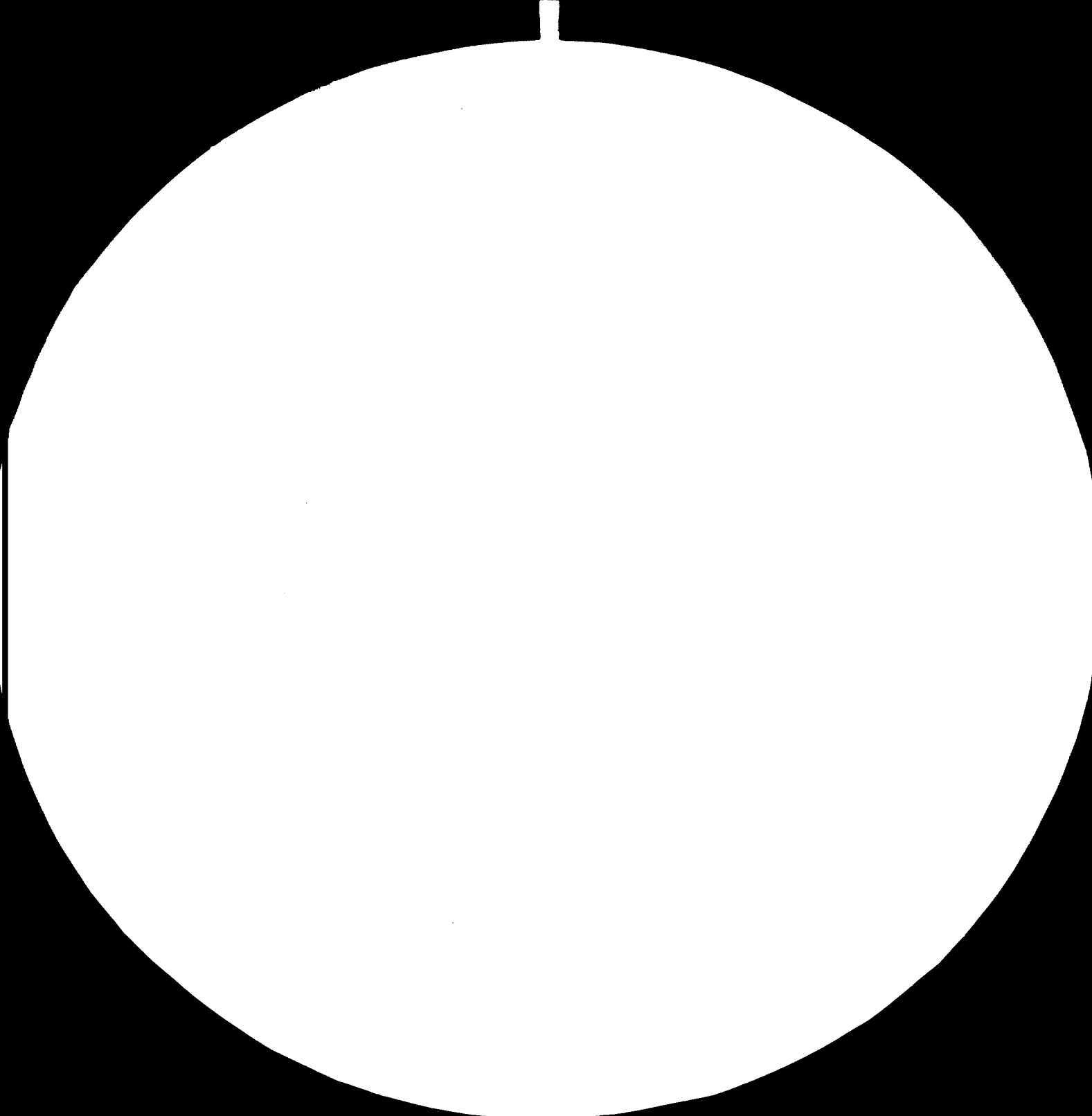
Technological change in microelectronics will continue in the coming decade along two parallel lines namely, the efficiency of signal handling components from which modern electronic equipment is made will

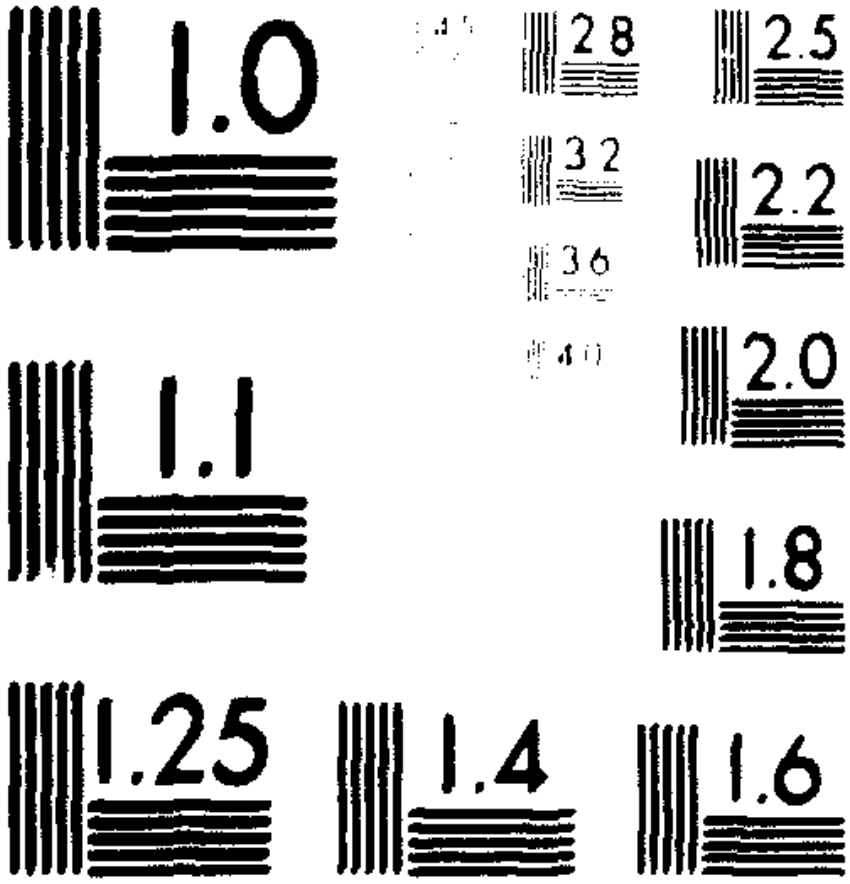
page 85 overleaf

of information media with an effect on personal habits of the populati[illegible]. Rising costs of travel and labour will exercise the major influenc[illegible] the speed and direction of these developments and the technological progress [illegible]vices mentioned earlier will provide the means of econo[illegible] implementa-tio[illegible]

Equally important changes will take place in the fie[illegible] servo systems. The microco[illegible]on a chip will revolutionalise [illegible]cope and the quality of performance [illegible]oducts of all industries. [illegible]ursions of electronics into other industri[illegible]sectors commenced wi[illegible]rival of solid state technology when elect[illegible] control of l[illegible] and expensive systems became possible. Modern microe[illegible]onic t[illegible]logy makes such controls possible and economically feasable [illegible] of even modest complexity and cost and further penetration must [illegible]c[illegible] as the sophistication of the circuits on a chip increas[illegible] Th[illegible]rporation of microelectronic based facilities funct[illegible] quality o[illegible]easing number of products of numerous industr[illegible] will be enhanced, [illegible] of their performance increased and [illegible]osts lowered. In many c[illegible]oelectronic controls will become [illegible]ssential component of new produ[illegible] ensure environmental acceptabil[illegible]y which has become a design parameter [illegible]idly increasing import[illegible]e.

E[illegible]tainment equipment established a place for electronic [illegible]nology in [illegible]ur homes some time ago. With the arrival of electronic game[illegible] domestic video recording machines the homo music centres which dominated [illegible]cene during the past ten years are becoming the entertainment centres and[illegible]





continue to increase and new functional applications will continue to be found in the traditional electronic systems as well as in an ever increasing number of products of other industries.

In the component area progress will continue to increase the packing density of signal handling elements with the consequent further decrease in the cost per unit function. This in turn will generate further advance in design of higher performance systems both in the traditional electronic fields as well as in systems serving other industries. In particular conceptual advances in man-machine interface equipment can be expected to bring about significant advances in man-machine integration affecting engineering concepts in all sectors of industry. The progress will be further accelerated by full impact of fibre-optics which will mature during the period under review bringing a new dimension and flexibility to the signal power and thus creating new device possibilities yet to be explored.

In the system design the main feature of the coming years will be further progress in the intergration of communication and information systems into a single family of services with a profound effect on many traditional practices in business and personal life. Thus systems providing rapid access under microcomputer control to central data banks and electronic files via intelligent terminals interconnected by high capacity transmission systems will eliminate much of the present day paper work generated in the offices of business and public administration. Electronic mail will start changing the nature of postal services and newspapers electronically available via domestic television set will begin to change the present role

become household control centres in the coming years. Controls of property protection equipment already increasingly found in households will be added to the functions of the centres as demand for protection equipment increases with further destabilisation of society. Equipment for programming of domestic activities and for controls of the environment will also be added to make the control centre a normal household service unit on par with kitchens and bathrooms.

With the recent introduction of viewdata service, further extension of the entertainment centre can be visualised to incorporate communication facilities and to extend the function of the centre into an information handling area. Concepts of the domestic entertainment/information centre and the remote 'work at home' terminals will merge with a profound effect on further development of office hardware.

In parallel with electronic household equipment new person oriented devices will be created by the microelectronic technology. The pocket calculator and the electronic watch will be joined by such items as an electronic health harness for in-house monitoring and automatic transmission of personal medical data to preventative medicine data banks, new diagnostic and therapeutical equipment will be added to the tools of conventional medicine etc, etc.

As with all advanced technologies, advancement of electronic technology owes the main impetus to its progress to military requirements. It would be impractical to wish to discuss here the impact which this aspect may have during the coming years. It is obvious however that any technological activity generated for military reasons in say laser technology, propagation

devices and similar items will only further enhance the changes discussed above.

Apart from microelectronics major thrust of technological change can be expected in technologies connected with production and conservation of materials and energy. Rising costs of energy and materials and demand for higher performance of products will be the main forces driving the process.

Taking the materials connected technologies first the pressure for higher performance materials will continue to come as before from the high technology areas like jet propulsion, space programmes and electronics but pressures will also be created by the changed conditions of the world economy bringing demand for materials of greater durability and better forming characteristics. Thus the motor industry and the consumer goods manufacturers will need upgraded materials to meet new demand for products which will have longer economic life and will use less energy during their production and their functional life. In the plastics industry for example higher performance materials will be needed to improve feedstock yields to compensate for the rising costs of oil and the construction industry will need new insulating materials to allow better control of energy consumption in the building.

Exhaustion of deposits and political pricing will make a continued use of some traditional materials uneconomic and substitutes will be needed to replace them. Therefore new processes will be developed to allow economic exploitation of deposits which so far were impractical to work on account of their limited size or the peculiar properties of the raw materials.

Also new possible uses of common raw materials in plentiful supply will be explored and new technologies will be developed for recycling of waste.

Intensive technological activity can be expected in the areas of non-oil energy sources. Technologies concerned with novel methods of exploitation of coal deposits will be pursued as long term projects. Work on the environmental aspects of nuclear power can be expected to continue with the view of obtaining medium term results.

Practical results in the field of secondary energy sources will be sought in the short term. In particular, efficiency of flat panel solar heating systems will be increased through use of better materials and improved system design. Efficiency of the photovoltaic cell will be improved and experimental installations built. Improved designs of the tilting blade wind turbine and of horizontal axle aerogenerators will be perfected into economically feasable supplementary electricity sources. Work on biomass techniques will intesify. Biogas digestor is likely to reach the point of becoming a recognised source of secondary power in rural environments. Viable processes will be developed for conversion of vegetable oils in diesel fuel and agricultural crops as petrol substitutes. Work will also continue on tidal mills and floating wave power converters aiming at practical results in a more distant future.

Work on energy conservation techniques will complement the progress of energy exploitation technologies. Much will be done in the heat management area leading to new design concepts, new types of hardware and new insulating materials. In turn building construction also be affected by the new

concepts. In some industries where in the past economies of energy were sacrificed to the convenience of production current products will need to be redesigned and factories prematurly re-equipped under the future heat management programmes. The plastics industry will be particularly affected.

So far industrial progress has been based on applications of physical sciences. It is possible to foresee however that in the future need will arise for industrial systems based on exploitation of biological ie renewable resurces and that the present day experiments of genetic engineering and work on cell propagation will lead to creation of practical new technologies yet not defined. The next decade may see the early tangible results of this basic research.

The progress of hardware based technologies so far described will be matched by software developments needed to make proper use of the intelligent and semi-intelligent machines which the hardware technology will produce.

APPENDIX F

F. DATA BANK

Information is at the root of every innovation. As the main theme of this report is industrial innovation, sources of industrial information available in Greece came under scrutiny during the study and it was concluded that the scope and availability of information will have to increase in future if the needed innovations were to be realized. It was felt therefore that an information centre should be created where trends of technological change in the world and its effect on industrial development at large would be monitored and information gathered on the basis of which recommendations of this study could be realistically implemented. Since it was also recommended that the implementation should be the responsibility of new purposely created infrastructural authority, clearly the centre should be situated within its structure as one of its departments. It was envisaged that the centre should be organised as a bank of data on innovative products launched in industrial countries and reported in business press and that the stored information should be arranged for easy retrieval.

Problems of adequate information flow were anticipated at the beginning of the project and establishment of the bank within the project was planned from the start. It was planned to establish the rudiments of the bank in KEPE with the view of transfering it later to the authority entrusted with implementation of the recomendation of the project. The plan unfortunately proved impractical because of the limitations of available resources and initial problems with development of an appropriate methodology. Ultimately, data of only few selected sectors were processed to serve the immediate needs of

the study. The method which was eventualy developed and used has shown itself entirely practical and effective and should be used in future to establish the bank when resources become available.

The method is based on information contained in nearly 20,000 cuttings from the Technical Page of Financial Times which the consultant collected for his professional records over the past 10 years. The Page which appears daily consists of reports on new technologically advanced products and as the paper aims at broadest readership among businessmen regardless of their technical orientation the reports cover the entire spectrum of technologies.

The products are reported under over 180 classified headings and for the purpose of the data bank it was first decided to reduce the number by bunching together reports oriented towards same or related markets, regardless of their original classification. By this approach, market and technology linkages were established and the headings reduced to about one t rd. Then within every new heading individual reports were classified by their market and technological information and arranged on three digit basis in technology and market oriented groups. Ultimately frequencies of reporting within every group were noted and interpreted as indicators of trends.

Reports were further classified by secondary technologies to complete the picture of skills needed for development of specific industrial sectors. Finally, particulars of the innovative manufacturers referred to in the reports were recorded in their respective three digit groups as potential sources of technology which could be contacted in future by Greek manufacturers.

Information comprised in the bank and arranged by the described method would serve all aspects of industrial development ranging from formulation of industrial policies by the Government and business strategies by entrepreneurs to selection of potential licensers abroad and definition of vocational training programmes at home.

To arrange the information in the bank for quick access, the data were recorded on specially designed cards. Sample item on Textile Machinery will be found in the annex to this appendix. The data in the sample indicate that in recent years technological development in this sector concentrated on machinery for making fabrics and on equipment to control quality of products (see 'Categories' cards). Within these two groups (see 'Systems') most of technical development took place in construction of finishing machinery (C.5.) and introduction of devices for control of quality of performance (D.2.). Within these areas, data further indicates that proofing (C.5.1.) and printing (C.5.2.) techniques and that equipment for control of knitting machinery (D.2.1.) are undergoing the most rapid change. Together 'Product' and 'Technology' cards indicate that advanced know-how in precision engineering and good expertise in chemical and electronic engineering are needed to take advantage of the identified trends.

Finally, the last card ('Sources of Technologies') informs that, for expample in ring trame spinning (A.1.1.), three firms in England and one in West Germany have recently released information on improvements to their products and that they could be potential sources of up-to-date technology.

Instead of using cards, the data could be stored in computer memory. The bank has sufficiently large base to justify it. Additional coding needed to retrieve information against inquiries could be derived simply by extending the three digit code of the card index to five digits and routines could be devised for technology related cross referencing which would give the bank additional power and usefulness.

Sample of Data Bank Item

TEXTILE MACHINERY

EXTILE
MACHINERY

POLICY

FOR CONSIDERATION BY GREEK INDUSTRY

1. Add-on equipment for continous control of quality of -

   - knitting
   - weaving
   - printing
   - dyeing

2. Modernisation of used machinery

   Priority of maching categories to be determined from the results of interviews

   NOTE: Modernisation means reconditioning and addition of quality control facility.

:XTILE
MACHINERY

FREQUENCY OF REPORTS

CATEGORIES	71	72	73	74	75	76	77	78	79	80	81	82	83	TOTAL
Yarn production	1	1			1	1	3	2	7					16
Fibre production	1	2	2			1		3	2					11
Fabric production	7	2	11		2		2	10	4					52
Quality control	2	9	6				3	3	5					27
Design aids	1	2	3											6

CATEGORIES

EXTILE
MACHINERY

FREQUENCY OF REPORTS

SYSTEMS	71	72	73	74	75	76	77	78	79	80	81	82	83	TOTAL
A – YARN PRODUCTION														
Spinning		1	1		1		1	1	5					10
Raw materials handling						1		1						2
Yarn finishing							2		2					4
B – FIBRE PRODUCTION														
Finishing		1	1					1	2					5
Production	1	1	1			1		2						6
C – FABRIC PRODUCTION														
Wearing			2					2	2					6
Carpet making	2	2			1		2		1					8
Fringe techniques	1						3	1	1					6
Knitting	1		1											2
Fabric finishing	3	9	8	1			3	7						22

SYSTEMS

XTILE
MACHINERY

FREQUENCY OF REPORTS

SYSTEMS	71	72	73	74	75	76	77	78	79	80	81	82	83	TOTAL
	D-QUALITY CONTROL													
Machinery updating							1		2					3
Machine control	2	9	6				2	2	3					24
	E-DESIGN AIDS													
Computer aid	1	2	3											6

XTILE
MACHINERY

FREQUENCY OF REPORTS

PRODUCTS	71	72	73	74	75	76	77	78	79	80	81	82	83	TOTAL
A1 — SPINNING														
Ring frame	1								3					4
Open frame		1						1	1					3
Winding							1		1					2
Aerodynamic					1									1
A2 — RAW MATERIALS HANDLING														
Cotton								1						1
Wool						1								1
A3 — YARN FINISHING														
Drying							1		2					3
Texturing							1							1

PRODUCTS

TEXTILE
MACHINERY

FREQUENCY OF REPORTS

	PRODUCTS	71	72	73	74	75	76	77	78	79	80	81	82	83	TOTAL
		C.5 – FABRIC FINISHING													
1	Proofing	1	1	1	1			1	2						7
2	Printing	1	1	4					1						7
3	Dyeing		2	1					2						5
4	Drying	1							1						2
5	Various		2	1				2	1						6
		D 2 – MONITORING / CONTROL													
1	Knitting	2	3	3						2					10
2	Spinning		3							1					4
3	Wearing		2					1	2						5
4	Dyeing			1					1						2
5	Tufting			2											2
6	Testing		1												1

EXTILE
MACHINERY

FREQUENCY OF REPORTS

TECHNOLOGIES		H	M	B			H	M	B
Fibre technology	59	X							
Precision engineering	59	X							
Chemical engineering	34		X						
Electronics	17		X						
Computer software	9			X					
Printing techniques	7	X							
Ceramics	1			X					
Optics	1			X					
					H - high M - medium B - basic				

TECHNOLOGIES

A.1.1. Pyrene, Ridgeway, Iver, Bucks SL0 9JJ, England, Tel:(735) 651812

Monsanto,10 Victoria Street, London SW1H ONQ,England,Tel:(1) 222-5678

Degussa, Postfach 2644, D-6000 Frankfurt 1, West Germany

RJ Hamer,Miles Road, Mitcham,Surrey CR4 3YB,England,Tel:(1) 648-2064

A.1.2. Prodorite, Eagle Works, Wednesbury, West Midlands, England, Tel: (21) 556-1821

Marubeni-Komatsu, Padgets Lane, Reditch, Worcs B98 ORT, England

Le Carbone-Lorraine, BP 31, rue Jean Jaures 92231,Gennevilliers,France

A.1.3. T Goldsmith, Initial House, 150 Field End Road, Eastcote, Middlesex, England, Tel: (1) 868-1331

A.1.4. KnitMesh, KnitMesh House, Sanderstead Station Approach, South Croydon, Surrey CR2 OYY, England, Tel: (1) 657-0921

Johnson Matthey, Orchard Road, Royston, Herts, England,Tel:(763)44161

Max Murray, PO Box 56, Hightt, Victoria 3190, Australia

FJ Edwards, Islington Park Street, London N1, England

A.2.1. Ect.

APPENDIX G

RESOURCE REQUIREMENTS

PRODUCT DEVELOPMENT AUTHORITY

1st Year

Personnel

1	Managing director	Drs (1980)	2,000,000	
2	Department chiefs		3,000,000	
3	Development engineers		3,600,000	
4	Senior technical officers		4,000,000	
4	Junior technical officers		2,800,000	
1	Public relations officer		1,200,000	
6	Secretaries		2,400,000	
1	Driver/handyman		350,000	
			Drs (1980)	19,350,000

Equipment

	Office furniture	1,500,000	
6	Typewriters, 6 calculators		
1	Copier, 1 Car	1,600,000	
			3,100,000

Operating costs

Rental (450 m^2)	1,500,000	
Heating etc.	750,000	
Subscriptions	500,000	
Travel	1,200,000	
Car costs	300,000	
		4,250,000
		26,700,000
15% contingency		4,000,000
1st Year total Drs. (1980)		30,700,000

2nd Year

Personnel

1	Managing director	Drs (1980)	2,000,000
4	Department chiefs		6,000,000
7	Development engineers		8,400,000
6	Senior technical officers		6,000,000
6	Junior technical officers		4,200,000
6	Technicians		3,000,000
1	PR/personnel officer		1,200,000
1	Accountant/legal officer		1,200,000
8	Secretaries		3,200,000
1	Driver/handyman		350,000
		Drs (1980)	35,550,000

Equipment

	Additional furniture	1,500,000
3	Typewriters, 3 Calculators	1,300,000
		1,800,000

Operating costs

Rental ($900m^2$)	3,000,000
Heating etc.	1,500,000
Subscription	650,000
Travel	2,000,000
Car costs	300,000
	7,450,000
	44,800,000
15% contingency	7,000,000
Risk capital	200,000,000
2nd Year total Drs (1980)	251,800,000

APPENDIX H

List of Contacts

ORGANIZATIONS	PERSONS INTERVIEWED
MINISTRY OF COORDINATION	E. Lemonias
KEPE	R. Theocharis (General Director) K. Nikolaou
CHAMBER OF COMMERCE AND INDUSTRY	L.D. Efraimoglou
ETVA	E. Tsamtsakis
ETEVA	J. Heliopoulos
BANK OF GREECE (Monetary Committee)	J. Vahaviolos
FEDERATION OF GREEK INDUSTRY	D. Kyriazis
FEDERATION OF INDUSTRIES OF NORTHERN GREECE	F. Kazazis
ELKEPA	Prof. G. Yannopoylos (President) D. Spentzas D. Kodonas
SCIENTIFIC R. and D. AGENCY (YEET)	G.S. Argyropoulos (Director) M. Koroyannakis
HELLENIC TECHNOLOGY CENTRE	D. Avaneas
HELLENIC INVESTMENT COMPANY S.S.	J.G. Georganas
ICAP - HELLAS	Mrs A. Magriotis
P.A. MANAGEMENT CONSULTANTS Ltd.(London)	J.W. Cooke
SCIENCE POLICY RESEARCH UNIT SUSSEX UNIVERSITY - BRIGHTON	Prof. C. Freeman

ORGANIZATIONS	PERSONS INTERVIEWED
BRITISH MINISTRY OF INDUSTRY-LONDON	J. Solomon
ALFA - LAVAL	K. Srnka
AMSTEL S.A.	J. Moraitis
ANASTASSIADIS S.A.	V.K. Anastassiadis
APOSTOLIDES S.A.	A. Bousgolitis
BROWN BOVERI NORMELEC S.A.	P. Mahler M. Lekakis T. Valasselis
COOPER S.A.	E. Lascos D. Mikroudis
DART HELLAS S.A.	J. Papadakis
E.B.E.H. S.A.	A. Kypriotis
ETMA S.A.	C. Sitmalides
FYROGENIS S.A.	C. Fyrogenis
GABRIEL S.A.	L. Tsakiris
HELARCO S.A.	G. Varfis E. Tsingopoulos
HELLINIKI TECHNIKI S.A.	Mr. Golemis Mr. Stambolis
KHM-DAMIGOS S.A.	Mr. Damigos K. Hadjiyossis D. Hassapidis
NAMCO S.A.	G. Kondogouris L. Vamvakas

ORGANIZATIONS	PERSONS INTERRIEWED
N.and M. PETZETAKIS S.A.	M. Petzetakis
P.D. PAPOUTSANIS S.A.	N. Kessissoglou
PAFAELIDES S.A.	(Mrs) Rafaelides
STEYR S.A.	G. Astrinides C. Christoforides
VEM S.A.	H. Platymessis
VIOMETALCO S.A.	D. Grigoriadis

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Table D.1.: Levels of Risk by Expected Management Adaptability

SECTORS	HIGH RISK		LOW RISK		INDETERMINATE	
	Number of Companies	% of Total Output	Number of Companies	% of Total Output	Number of Companies	% of Total Output
Food Processing	104	39	30	35	217	26
Beverages	17	27	10	63	46	10
Textiles	154	40	66	51	97	9
Plastics	72	47	12	30	131	23
Chemicals	63	27	19	61	74	12
Basic Metals	6	4	9	96	0	0
Metal Products and Machinery	49	47	6	14	105	39
Electrical Equipment	52	34	17	47	81	19
Motor Industry	10	37	9	32	26	31
Total Sample	527	34	178	45	777	19

Table D.2.: Levels of Risk by Technology Associations

	HIGH RISK		LOW RISK	
	Number of Companies	% of Total Output	Number of Companies	% of Total Output
Food Processing	334	90	18	10
Beverages	61	65	12	35
Textiles	298	75	21	25
Plastics	171	62	42	38
Chemicals	96	40	68	60
Basic Metals	7	55	8	45
Metal Products and Machinery	134	61	36	39
Electrical Equipment	99	37	58	63
Motor Industry	35	33	11	67
Total Sample	1235	57	274	43